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830-H-5 (1) NAS 1.53: OSSA 2-88

NASA
National
Aeronautics and
Space
Administration

May 17, 1988
A.O. No. OSSA 2-88

Announcement of Opportunity

Small-Class Explorer Mission

Notice of intent due: August 1, 1988 **Proposals due: September 30. 1988**

National Aeronautics and
Space Administration

Washington, D.C.
20546

Reply to Attn of: EZ (NR)

MAY 0 5 1988

Dear Colleague:

The National Aeronautics and Space Administration (NASA) Office of Space Science and Applications is interested in receiving basic research proposals to conduct space science investigations in the Explorer Program using scientific payloads on spacecraft launched by Scout-class launch vehicles. This solicitation is open to all categories of organizations: educational institutions, industry, nonprofit institutions, NASA Centers, and other governmental agencies, as well as foreign research institutions.

This NASA Announcement of Opportunity (A.O.) constitutes a broad agency announcement as contemplated in Federal Acquisition Regulation 6.102 (d) (2). The enclosed A.O. (enclosure 1) will be open for the period through September 30, 1988. The proposals will be subjected to a peer review with final selection decisions made by the Associate Administrator for Space Science and Applications. The selection criteria will be based on the following:

- overall scientific and technical merit of the proposed investigation and its likely impact on space science;
- the adequacy of the proposed investigation to fulfill the objectives of the experiment;
- the compatibility of the investigation with the Scout-class launch vehicle capability and NASA's available support capability;
- the compatibility of the proposed instrumentation with the proposed spacecraft hardware;
- the current state of development of the proposed instrumentation and the ability to meet the 3 year (or less) development schedule;

- the realism of the proposed cost;

- the adequacy of the development approach for the experiment, as evaluated by the peer review team, to develop the research for less than the 30 million dollars (Fiscal Year 1988 dollars) cost ceiling for the Scout-class Explorer Program (costs do not include launch services and mission operations costs subsequent to 30 days after launch);

- the overall merit of the management plan submitted in accordance with Appendix C, Section II; and

- other factors that pertain to accomplishing the program's objectives. These factors include:

  - the degree to which the proposed mission complements other elements of NASA's program in the relevant discipline and serves to meet the overall scientific goals of that program;

  - the adequacy and completeness of the data reduction and analysis plan;

  - the capabilities and experience of the investigators; and

  - the experience and interest of the investigator's institution in providing the necessary support to insure that the investigation can be completed satisfactorily.

In an effort to provide you with more information and address your questions and concerns, a preproposal conference will be held at the NASA Goddard Space Flight Center (GSFC) on Tuesday, June 21. Registration will start at 7:30 AM in the Building 8 lobby with the conference commencing at 9:00 AM. A tentative agenda, GSFC facilities/location maps, and motel/hotel information are enclosed (enclosure 2). To receive the special motel/hotel rate you must identify yourself as being associated with the Scout Class Explorer program.

A preregistration form (enclosure 3) is enclosed for your convenience. To preclude extensive delays in gaining access to GSFC, this form must be filled out and returned to Mr. Robert Pincus, NASA Goddard Space Flight Center, Code 740.2, Greenbelt, Maryland, 20771, by June 6, 1988. If the preregistration form is not received by June 6th, the attendee can expect delays in gaining access to the conference area. Foreign nationals and non-preregistrants must obtain authorization for entrance into GSFC at the security office located adjacent to the main gate. GSFC is a secure area, and attendees are only permitted access to the conference facilities.

Sincerely,

L. A. Fisk

L. A. Fisk
Associate Administrator for
Space Science and Applications

3 Enclosures

ENCLOSURE 1

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, DC 20546

ANNOUNCEMENT OF OPPORTUNITY

SMALL-CLASS EXPLORER MISSIONS

AO No. OSSA 2-88

Issue Date: May 17, 1988

ANNOUNCEMENT OF OPPORTUNITY

FOR

SMALL-CLASS EXPLORER MISSIONS

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I. DESCRIPTION OF THE OPPORTUNITY

The National Aeronautics and Space Administration (NASA) announces the opportunity to conduct space science research in the Explorer Program using scientific payloads on spacecraft launched by Scout-class launch vehicles. The Office of Space Science and Applications (OSSA) is embarking on a series of small payload, scientific missions that can be launched at a rate of one to two missions per year depending on mission cost, and availability of launch vehicles and funds. These missions are intended to provide rapid execution of scientific investigations with less than three years elapsing from the start of the detailed design and hardware development phases until launch of the mission. Costs for development of the missions are expected to average less than approximately $30M in Fiscal Year (FY) 1988 dollars.

This Announcement of Opportunity (AO) invites proposals for the first few missions. The number of missions to be chosen will be determined by the costs of proposed investigations, the time required for development and flight, the status of the Explorer Program budget, and NASA's intention to have a short queue established for this program. The opportunity is restricted to the scientific disciplines which are listed in Section II A. It is the intent of this AO to solicit research and attendant investigations which are sufficiently mature scientifically and technically to proceed directly into the hardware development phase with only a short period (few months) of program implementation planning.

The Small-class Explorer Program is not an approved program, and this AO does not constitute an obligation on the part of the Government to carry the proposed effort to completion. This AO is being issued in order to assure the timely selection of missions and investigations and to aid in the detailed design of missions in anticipation of funding authorization in FY 1989. The investigators selected in response to this AO will be expected to lead a brief mission design study, the flight hardware preparation and launch, the data acquisition and analysis, and the publication of results from the mission. The selected investigators will have exclusive use of the scientific data from the mission for a period of 12 months after receipt of the data. The development phase is planned to start in the first half of FY 1989 and to be directed toward a launch in the 1991-1992 time frame.

Any guest observer program or subsequent data analysis and interpretation activities will be supported through programs other than the Explorer Program.

NASA intends that the spacecraft associated with the initially selected mission will be launched on currently available Scout vehicles, or by using an equivalent launch service, which can carry a total payload mass of about 200 kg. Such a spacecraft can provide about 25 to 100 watts of power to the investigation, depending on mission orbit and pointing requirements, and can have a data rate of approximately 10 kilobits per second, or less. Scout vehicle launch facilities exist at the NASA Goddard Wallops Flight Facility, Virginia; Vandenberg Air Force Base, California; and the San Marco Range, Kenya. Performance data for the Scout vehicle are given in Appendix A and are typical of the technical capability for this class of vehicle. Also provided in Appendix A is information relevant to possible spacecraft and mission operations. NASA is currently procuring launch services for this class of launch vehicle. This AO is not intended nor should it be interpreted to constrain or affect this procurement of launch services. Missions selected by subsequent AO's are planned to use the new launch services.

The Special Payloads Division, Code 740, at the NASA Goddard Space Flight Center (GSFC), Greenbelt, Maryland, will manage activities associated with the study and implementation phases of the mission. This Division is expected to assign a significant level of civil service personnel to mission development activities and integration of instrumentation with the spacecraft. It can also provide to proposers readily available technical information related to Scout-class vehicle capability, and existing and planned Scout-class spacecraft capabilities.

II. ANNOUNCEMENT OBJECTIVES

A. SCIENTIFIC OBJECTIVE

The scientific objective of the Small-class (Scout) Explorer Program concerned with this AO is to conduct important scientific research in the space science disciplines traditionally served by the Explorer Program. These areas are astrophysics (radio, submillimeter, infrared, visible, ultraviolet, x-ray, and gamma ray astronomy, and relativity), space physics (space plasma physics, solar physics, heliospheric physics and cosmic ray physics), and upper atmospheric science.

B. PROGRAM OBJECTIVES

The Small-class Explorer Program seeks to conduct scientific research of modest programmatic scope which can be launched within about three years of selection. The program intends to provide a continuing opportunity for quickly implemented flights of small free-flyers to conduct focused investigations which complement major missions, prove new scientific concepts, or make significant contributions to space science in other ways. It is the goal of the program to obtain a flight frequency of at least one flight per year. The scope of the missions is expected to be such that a single principal investigator will have responsibility for an individual investigation.

NASA recognizes that international cooperation offers potential scientific, technical, and financial benefits to all partners, and NASA welcomes international participation in the program. NASA has been approached by several countries interested in small, cooperative missions. In response to this interest, a special opportunity for bilateral cooperation is present in this AO in addition to the traditional approach to international participation. Both of these approaches are described below. All international participation will be conducted on a no exchange of funds basis.

In the "traditional approach", the international partner will participate as a co-investigator on a team led by a U.S. principal investigator on a NASA mission. The level of participation by the international partner in this approach can vary. The participation will usually involve the contribution of scientific instruments, or a portion thereof, by the foreign partner and a subsequent sharing of the data from the mission.

This AO also invites proposals sponsored by foreign governments for joint missions executed under bilateral, international agreements. In a joint mission, the contribution of the partner is envisioned to be the spacecraft development and integration, with scientific instruments provided by both partners. NASA would provide the Scout-class launch service with support for flight operations to be negotiated on a case-by-case basis. Substantial scientific benefit to both partners would be expected. The proposed mission would be expected to be developed in close coordination with the appropriate U.S. scientific community. Potential international partners are expected to work with the appropriate NASA scientific discipline chief during the development of their proposal. Foreign

proposers who need help in identifying the appropriate NASA scientific discipline chief should contact Dr. George Newton at the address and telephone number shown in Section VII, E. and G. Mission proposals received from potential international partners will be selected in competition with mission proposals from U.S. principal investigators. If the proposed mission is chosen for implementation, and if there are several U.S. scientific groups interested in and capable of providing scientific instruments within the U.S. portion, NASA reserves the right, at its sole discretion, to competitively select, by means other than this AO, the U.S. scientific investigations, including instruments, for the selected mission.

III. BACKGROUND

The Explorer Program has for many years provided flight opportunities for scientific investigations using modest instrumentation in the scientific disciplines of space physics, astrophysics, and upper atmospheric science. The Explorer spacecraft have served frequently both to open up new fields of space science and to investigate in detail one particular aspect of science. Former missions have ranged from relatively simple spinning spacecraft measuring the ambient space environment to sophisticated atmospheric and astrophysical missions.

The Explorer Program has several classes of activity for flight opportunities. These may be approximately characterized by the nature of the capability offered the scientific community. These classes are:

"Delta-class" and/or Space Transportation System (STS) Launched Payloads -- characterized by the scope and capability of investigations conducted on spacecraft launched by a Delta-class launch vehicle which also can be compatible with launch by the STS. Explorer Program cost (in FY 1988 dollars) for development of spacecraft and instrument payload is typically greater than $50M and less than $150M.

"Scout-class"--characterized by the scope and capability of investigations conducted on spacecraft launched by the Scout-class launch vehicle. This Small-class Explorer Program cost (in FY 1988 dollars) for development of spacecraft and instrument payload is expected to average about $30M or less. (Note: The Scout vehicle is used only to typify the historical capability for this class of

activity and is not intended to prejudice current procurements for this class of launch service.)

"Mission of Opportunity"--characterized by furnishing an instrument or part of an instrument or payload to be integrated into a mission of another country or U.S. agency. These opportunities may be planned, or unplanned in the sense that they may arise from situations external to NASA. Explorer Program cost (in FY 1988 dollars) for development of the instrument or part of the payload is typically less than $10M. Usually, less than 15% of the program budget in any given year is used for missions of opportunity.

This AO is concerned only with opportunities which are characterized as "Scout-class". The "Delta-class" opportunities are selected by other means. The "Mission of Opportunity" candidates usually arise from unique initiatives which originate external to NASA and/or outside the regular Explorer Program sequence and often are selected from unsolicited proposals.

This Small-class Explorer Program intends to capitalize on the availability of mature and/or developed instrumentation to carry out important scientific investigations on a shorter time scale and at a higher mission frequency than was previously attained.

IV. PROPOSAL OPPORTUNITY PERIOD

Proposals must be received at the address listed in Section VII no later than 4:30 p.m. Eastern Daylight Time, September 30, 1988. NASA may later amend this AO to provide for subsequent dates for submission of proposals, if warranted.

V. SUPPLEMENTARY PROPOSAL PREPARATION INFORMATION

The information contained in paragraphs VI through X supplement or modify for this Announcement the information contained in General Instructions and Provisions and Detailed Guidelines for Proposal Preparation extracted from NASA Federal Acquisition Regulation Supplement (NFS) 18-70 contained in Appendices B and C. Section VIII, of Appendix B and Paragraph 4, Section I, of Appendix C do not apply to this Announcement.

VI. REQUIREMENTS AND CONSTRAINTS

The Small-class Explorer Mission Program is intended to provide quick implementation of scientific opportunities for space science investigations. Therefore, strict requirements will be exercised during selection of the investigations regarding scientific and technical maturity, cost, and development schedule. Evaluation criteria are listed in paragraph VIII. To ensure that instrumentation is compatible with all cost, schedule, and technical requirements, the investigations selected under this Announcement will be implemented in two phases. A tentative selection will be made for implementation definition only and this first phase is expected to have a duration of a few months or less. NASA will reevaluate the scientific, technical, and cost status of each investigation before proceeding into the second phase. After evaluation of results from the first phase, selections will be confirmed or rejected for the second phase which will consist of development, flight operations, and data analysis. Proposals submitted in response to this AO must cover the entire program, including both phases, and should be based on the best available data, including that contained herein.

Prospective U.S. proposers should realize that responses to this AO will not be permitted to prejudice or constrain any subsequent procurement activities on the part of NASA in pursuit of acquiring suitable spacecraft. U.S. principal investigators responding to this AO can propose a mission which uses a new spacecraft design that is uniquely configured to their investigation, or they can propose to use an existing or previously developed spacecraft, or a planned new Scout-class spacecraft. However, for programmatic or technical reasons, NASA may choose to provide a spacecraft from a source other than that described in the proposal. NASA will procure and use an appropriate spacecraft for the mission. GSFC will manage the implementation of the program and will be responsible for system management and integration activities.

Responses to this AO will be accepted from principal investigators at U.S. institutions or from international partners seeking to lead a cooperative mission as described in Section II B. U.S. investigators who propose missions involving international participation should indicate in their proposals the contemplated division of responsibility between NASA and the other partners. Additional requirements for foreign proposers are given in Paragraph X and in Appendix C, Section II, paragraph 3.

NASA's approach to performance assurance for the Small-class Explorer Missions is discussed in Appendix D. An outline of the presently envisioned performance assurance requirements will be summarized in an addendum to this AO, which will be distributed at the preproposal conference, the schedule for which is in Section VII, F and Section IX. This addendum will be mailed to proposers who submit a Letter of Intent.

VII. PROPOSAL SUBMISSION INFORMATION

A. Address

All U.S. proposals should be sent to the following address:

Code EZ, AO No. OSSA 2-88.
Office of Space Science and Applications
National Aeronautics and Space Administration
Washington, DC 20546

The procedures for submission of foreign proposals or U.S. proposals with foreign participants are contained in Paragraph X and Appendices B and C.

B. Format

The proposal should be written in English and submitted in two sections: Investigation and Technical Plan (and appendices), and Management and Cost Plan. The cost section can be omitted for foreign contributions to a cooperative mission. Guidelines and additional information regarding proposal format and proposal preparation are provided in Appendix C of this AO.

The main body of each proposal (Appendix C, Section I) should be limited to the equivalent of 26 single-spaced, typewritten pages. Additional pertinent information, such as recent publications, may be added as an appendix to the proposal. It is our intention, however, to ease the burden of proposal preparation and review by limiting the volume of information to be submitted and reviewed, and no commitment is made by NASA to consider material in the appendix of the proposal in evaluating the proposal. The Management Plan and Cost Plan (Appendix C, Section II) can be of a length appropriate to convey the necessary information.

C. Proposal Quantity

Thirty-five (35) separately bound copies of the proposal must be submitted. One copy of each section should be clean black on white paper, of a quality suitable for reproduction.

D. Certification

The proposal must be signed by an official of the principal investigator's institution authorized to certify institutional support and sponsorship of the investigation, and the management and the financial parts of the proposal. In those cases of foreign proposals and U.S. proposals that include foreign participation, the foreign sponsoring agency must certify support and sponsorship of their participation. If a foreign proposal or a U.S. proposal with foreign participation is selected, NASA will arrange with the sponsoring foreign agency for the proposed participation on a cooperative (no exchange of funds) basis, in which NASA and the sponsoring agency will each bear the cost of discharging their respective responsibilities.

E. Letter of Intent

A Letter of Intent to Propose should be sent to the following address on or before August 1, 1988.

Dr. George P. Newton
Office of Space Science and Applications
Code EZ, AO No. OSSA 2-88
National Aeronautics and Space Administration
Washington, DC 20546

The Letters of Intent should include the following information:

Name, address, and telephone number of the principal investigator and all co-investigators.

Names and addresses of sponsoring organizations.

Brief statement of specific objectives of the investigation.

Whether you propose to use a previously developed spacecraft, the new scout-class spacecraft, or will propose a unique spacecraft.

Preparers of Foreign proposals and U.S. proposals which contain foreign participants should send a copy of the Letter of Intent to the NASA International Relations Division at the address given in Appendix C for submission of foreign proposals. Material in the Letters of Intent is for information only and is not binding on the signatories.

F. Preproposal Conference

A preproposal conference is planned. Specific questions of a scientific, technical, or programmatic nature can be discussed at the conference. The conference will be held at the NASA Goddard Space Flight Center, Greenbelt, Maryland, on June 21, 1988.

G. Technical Contacts

Inquiries of a technical or programmatic nature should be directed to Dr. Newton at the address given in Section VII, E above, or telephone area code 202, number 453-1435. Inquiries of a scientific nature should be directed to the appropriate scientific discipline chief. If the NASA discipline chief is not known, Dr. Newton can provide the appropriate name and telephone number.

VIII. PROPOSAL EVALUATION, SELECTION, AND IMPLEMENTATION

A. Evaluation of Proposals

Proposals received in response to this AO will be reviewed and selected in accordance with the procedures stated in NFS 18-70. All foreign proposals received will go through the same evaluation and selection process as proposals originating in the U.S. Note specifically that proposals may be evaluated by a contractor selected by NASA. The contractor, utilizing scientific peers, will evaluate the scientific and technical strengths and weaknesses of each proposal and will provide the NASA Headquarters Explorer Program Office with a report summarizing these strengths and weaknesses. A subcommittee of the Space Science and Applications Steering Committee made up of full-time Government employees will be appointed by the Associate Administrator for Space Science and Applications. This subcommittee will, upon consideration of the contractor's report, categorize all proposals in accordance with the category definitions contained in NFS 18-70. Proposals will be further reviewed for engineering, integration, management, and cost aspects by

the Special Payloads Division at the NASA Goddard Space Flight Center. On the basis of these reviews, and the reviews of the Explorer Program Office and the Steering Committee, the Associate Administrator for Space Science and Applications will select the proposals to be supported for definition, development, and flight.

B. Evaluation Criteria

The selection of proposals which best meet the scientific objective stated in the AO is the fundamental aim of the acquisition process. To achieve this aim, the criteria listed below have been established for the evaluation of all proposals submitted under this AO. The criteria are listed in order of decreasing importance:

1. The overall scientific and technical merit of the proposed mission and its likely impact on space science.

2. The adequacy of the proposed investigation to fulfill the objectives of the mission.

3. The compatibility of the investigation/mission with the Scout-class vehicle capability and NASA's available mission support capability.

4. The compatibility of the proposed instrumentation with the proposed spacecraft hardware.

5. Current state of development of the proposed instrumentation and the ability to meet the three year or less development schedule target.

6. The realism of the proposed cost.

7. The adequacy of the development approach for the mission, as evaluated by the government, to develop the mission for less than the approximate $30M (in FY 1988 dollars) cost target to the Small-class Explorer Program (not including launch services and mission operations costs subsequent to 30 days after launch).

8. The overall merit of the management plan submitted in accordance with Appendix C, Section II.

9. Other factors that pertain to accomplishing the program's objectives. These factors include:

a) the degree to which the proposed mission complements other elements of NASA's program in the relevant discipline and serves to meet the overall scientific goals of that program;

b) the adequacy and completeness of the data reduction and analysis plan;

c) the capabilities and experience of the investigators; and

d) the experience, interest, and prior performance of the investigator's institution in providing the necessary support to insure that the investigation can be completed satisfactorily.

IX. PROPOSAL SCHEDULE

The following are key dates pertaining to this Announcement:

Date of release of AO	May 17, 1988
Preproposal Conference	June 21, 1988
Letters of Intent due	August 1, 1988
Proposals due	September 30, 1988
Latest date to accept foreign government endorsement	November 7, 1988
Target date for announcement of selections	April 1989

X. SPECIFIC GUIDELINES FOR NON-U.S. PROPOSERS

Proposals from non-U.S. investigators, submitted in the traditional approach discussed in Section II B., should be incorporated into the prime proposal submitted by the U.S. investigator. An information copy of the entire proposal together with adequate information to identify and highlight the role of the non-U.S. contribution in the U.S. mission and a letter of transmission from the sponsoring foreign agency must be sent to the NASA International Relations Division at the address given in Appendix C, Section II. by September 30, 1988. An information copy of the proposal submitted in the special approach discussed in Section II. B. and a letter

of transmission from the sponsoring foreign agency must be sent to the NASA International Relations Division at the address given in Appendix C, Section II. by September 30, 1988. NASA recognizes that additional time is frequently required to obtain formal governmental approval of a proposal submission, and will, therefore, accept foreign government endorsements up to November 7, 1988. Foreign government endorsements are to be sent to the NASA International Relations Division.

XI. APPENDICES

The following appendices are provided as a part of this announcement:

A. Description of the Scout Launch Vehicle, A Possible Spacecraft, and Possible Ground Support Systems
B. General Instructions and Provisions
C. Guidelines for Proposal Preparation
D. Performance Assurance Approach for Small-class Explorer Missions.

The Small-class Explorer Program provides a new, rapid, and low cost opportunity for launching scientific instrumentation into space. I look forward to receiving many imaginative and innovative proposals for flight on the Small-class Explorers.

Sincerely,

L. A. Fisk

L. A. Fisk
Associate Administrator for
Space Science and Applications

APPENDIX A

DESCRIPTION OF THE SCOUT LAUNCH VEHICLE, A POSSIBLE SPACECRAFT, AND POSSIBLE GROUND SUPPORT SYSTEMS

1.0 THE LAUNCH VEHICLE

The launch vehicle will be obtained by competitive procurement. Scout, an example of a possible launch vehicle, yields the minimum performance the selected vehicle is expected to provide.

Vehicle information in this Appendix was derived from the Scout Planning Guide which is available from the Special Payloads Division, Code 740, NASA Goddard Space Flight Center (GSFC), Greenbelt, MD, 20771.

The Scout launch vehicle is a solid propellant, four stage booster system. The payload consists of the science instruments, bus, adapter, separation system, and any special hardware not part of the standard launch vehicle. Payload capacity may be as much as 250 kilograms for a circular orbit at low altitude and low inclination. Higher orbits and higher inclinations allow less payload mass, as can be seen in Figures 1, 2, and 3.

Scout payloads are launched from three sites, depending upon the desired inclination:

Vandenberg Air Force Base, California, for high inclination orbits

Wallops Flight Facility, Virginia, for moderate inclination orbits

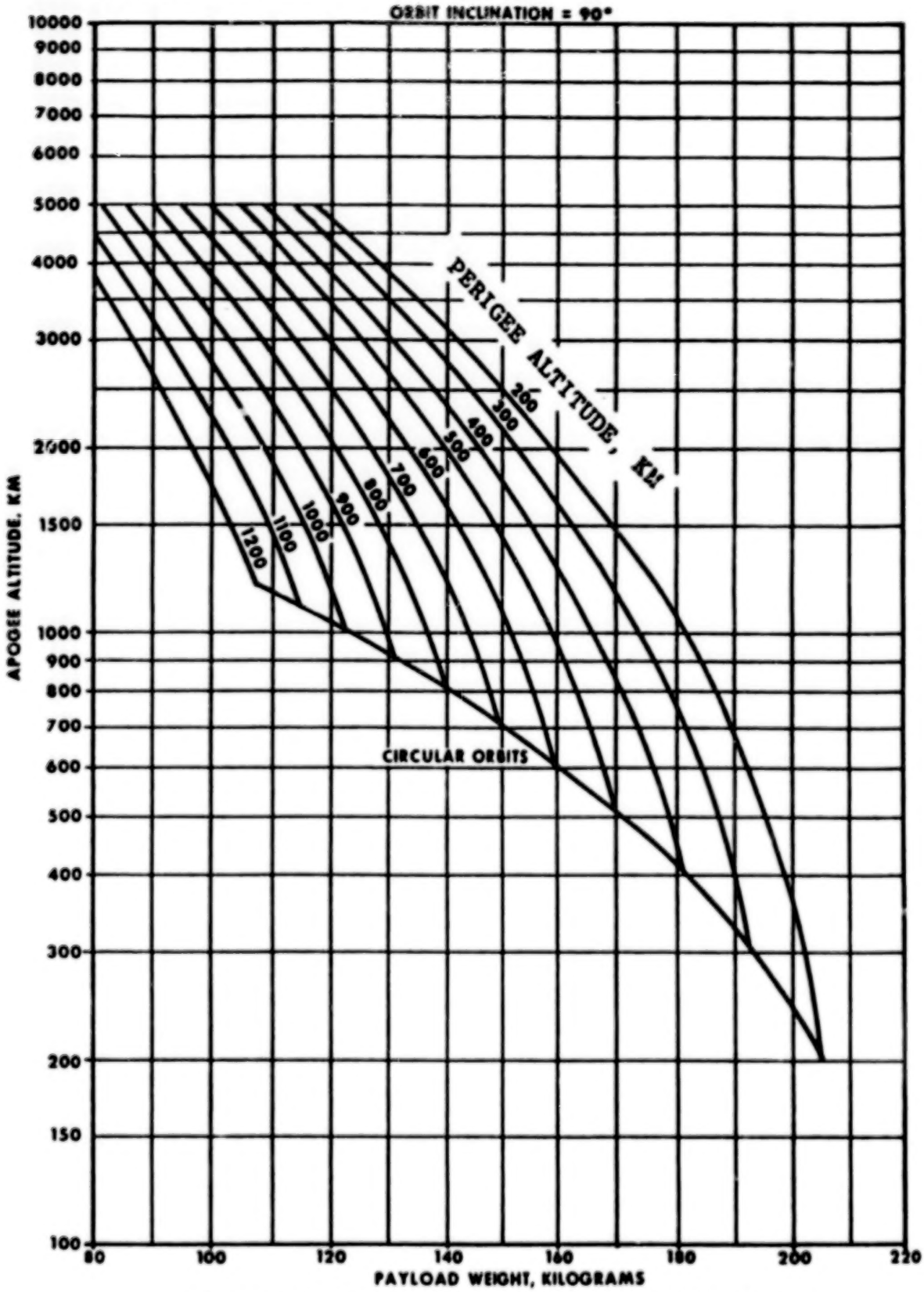
San Marco, Kenya, for low inclination orbits

The payload is enclosed by the fourth stage's heat shield, addressed in Section 2.1.1.

Figure 4 is an example of apogee and perigee altitude dispersion estimates. Missions with small error tolerances, such as those needing sun-synchronous orbits, will need a propulsion system for orbit correction.

ALGOL IIIA
CASTOR IIA
ANTARES IIA
ALTAIR IIIA
1.07 METER DIA. HEATSHIELD

FOUR STAGE SCOUT
(G-1)



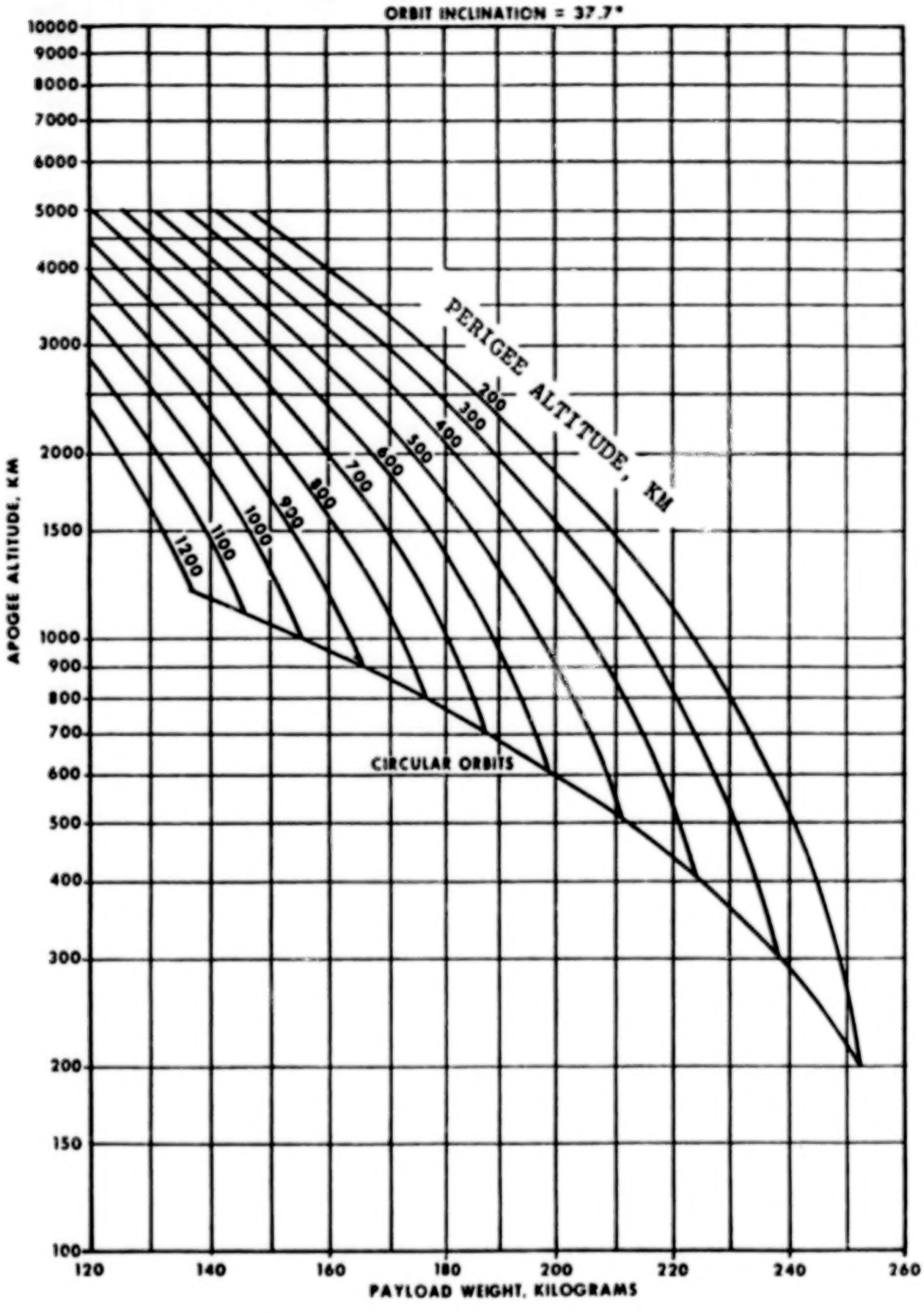
ELLIPTICAL ORBIT PERFORMANCE – VANDENBERG AFB

FIGURE 1

16

ALGOL IIIA
CASTOR IIA
ANTARES IIIA
ALTAIR IIIA
1.07 METER DIA. HEATSHIELD

FOUR STAGE SCOUT
(G-1)



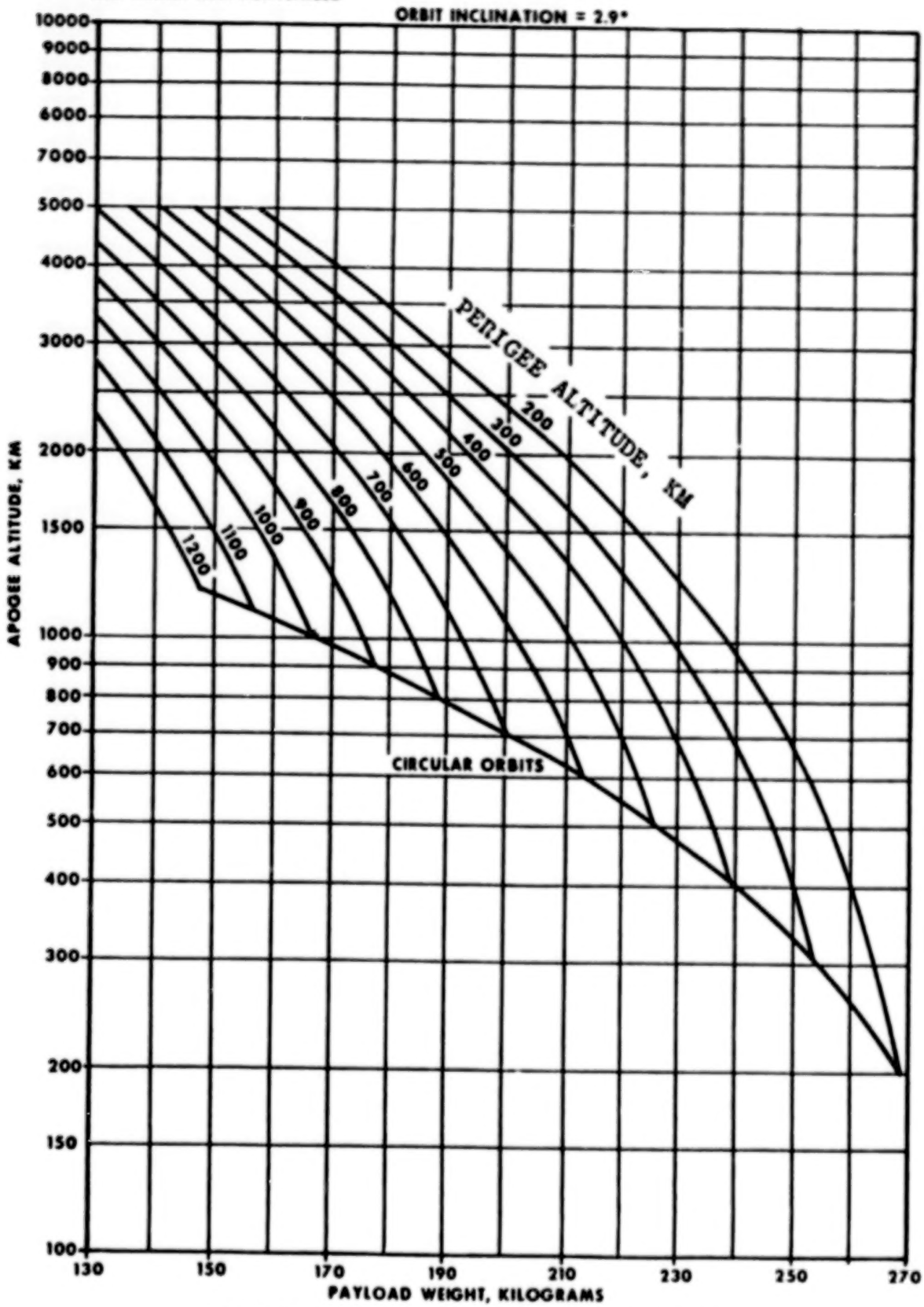
ELLIPTICAL ORBIT PERFORMANCE – WALLOPS

FIGURE 2
A-3

17

ALGOL IIIA
CASTOR IIA
ANTARES IIIA
ALTAIR IIIA
1.07 METER DIA. HEATSHIELD

FOUR STAGE SCOUT
(G-1)



ELLIPTICAL ORBIT PERFORMANCE – SAN MARCO

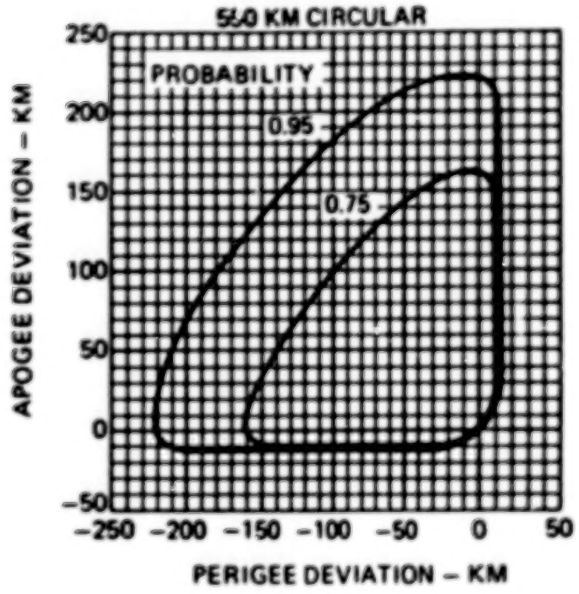
FIGURE 3

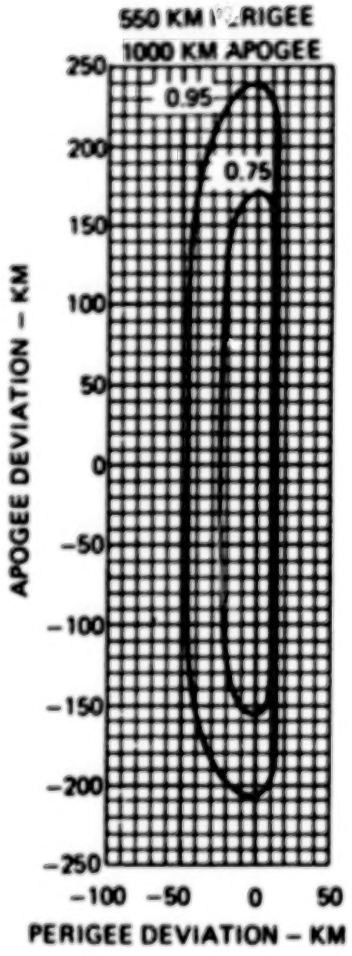
SCOUT LAUNCH DISPERSIONS - ALTITUDE

NOTE:

(1) ACCURACY BASED ON SCOUT FLIGHT EXPERIENCE

(2) NOMINAL INJECTION OCCURS AT PERIGEE





Scout vehicle orbital accuracy estimates are made as a part of the analysis of each mission. This accuracy, based on vehicle flight experience, is presented as an isoprobability contour which shows the apogee-perigee deviations for probability values of 0.95 and 0.75. The above figures illustrate the isoprobability contours for a circular and an elliptic orbit each having an injection altitude of 550 kilometers. These contours show the distribution of possible combinations of apogee-perigee deviations consistent with a specific probability value (i.e. for a 0.95 probability contour, the apogee-perigee deviations of an obtained orbit will fall within the contour 95 percent of the time). An example use of the contours is as follows: For a probability value of 0.95 on a 550 kilometer circular orbit, assume a perigee deviation of –80 kilometers. The corresponding apogee deviation will be between –10 and +195 kilometers. The maximum apogee deviation of the contour of +220 kilometers is not obtainable at a perigee deviation of –80 kilometers.

FIGURE 4

2.0 THE SPACECRAFT

The spacecraft consists of a bus and a science instrument module. The bus includes subsystems for attitude control, orbit control, communications, command and data handling, power, thermal control, and the structure. The instrument module includes the science instrument, its electronics, sensors, thermal control systems, and structural interfaces with the bus.

2.1 Bus Subsystems

The bus consists of the subsystems described below.

2.1.1 Structure and Mechanical

The spacecraft bus structure is basically a semi-monocoque, hexagonal can 20 inches long. It is attached to the fourth stage of the Scout via the standard 25E adapter section as shown in Figure 5. This configuration will accommodate a wide variety of instrument configurations and mission unique subsystems.

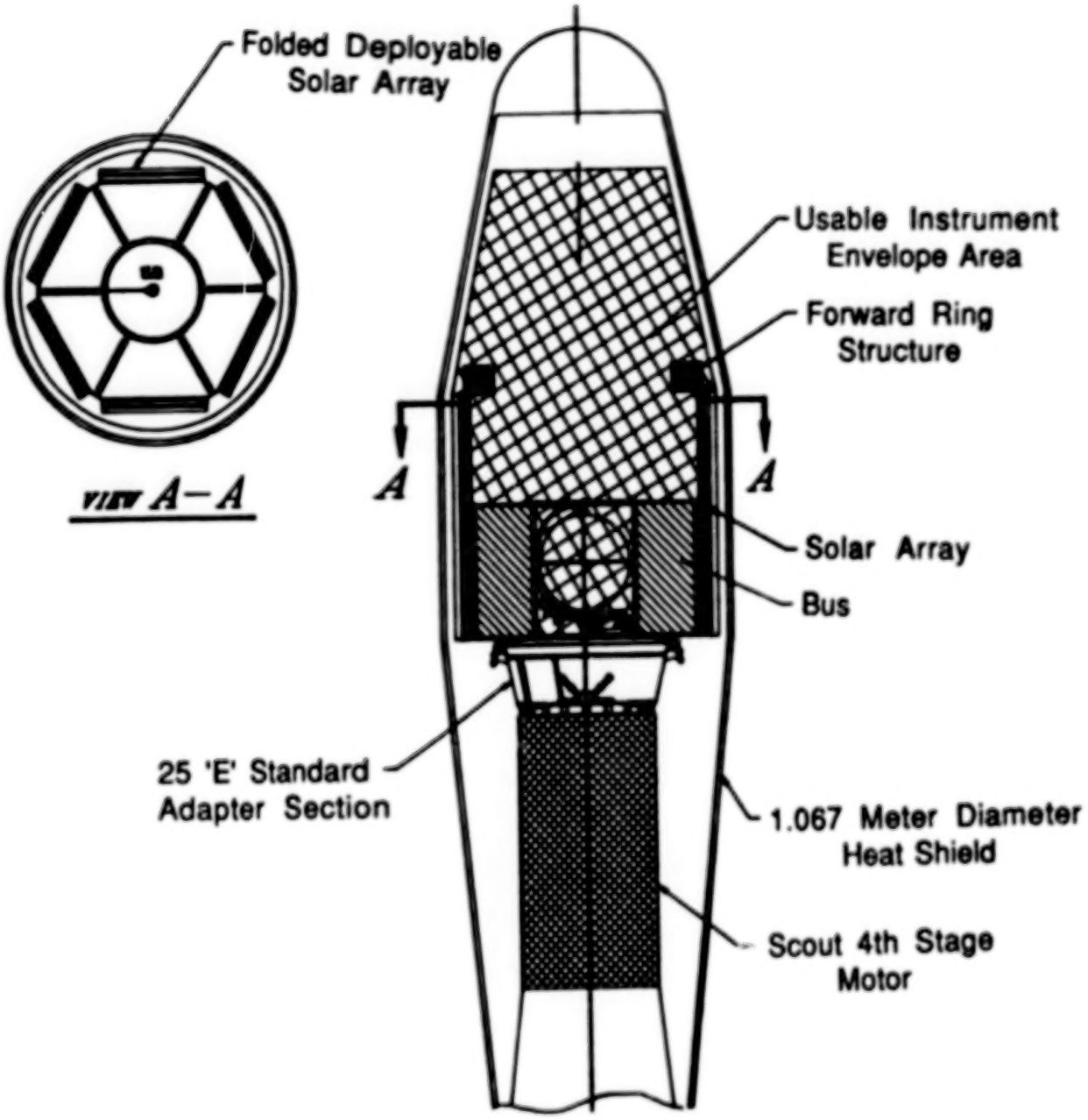
Figures 5 and 6 show the space available for the instrument module. The central section of the bus may be used by science instruments when the propulsion subsystem is not required.

The maximum Scout payload mass can be derived from Figure 1, 2, or 3, depending on the launch site. The maximum mass of the science instrument module is the maximum payload mass minus the mass given in Table 1.

The spacecraft will be statically and dynamically balanced by adding balance weights, which increases the total spacecraft mass shown in Table 1. Science instrument module imbalances should be minimized to reduce the amount of balance mass required.

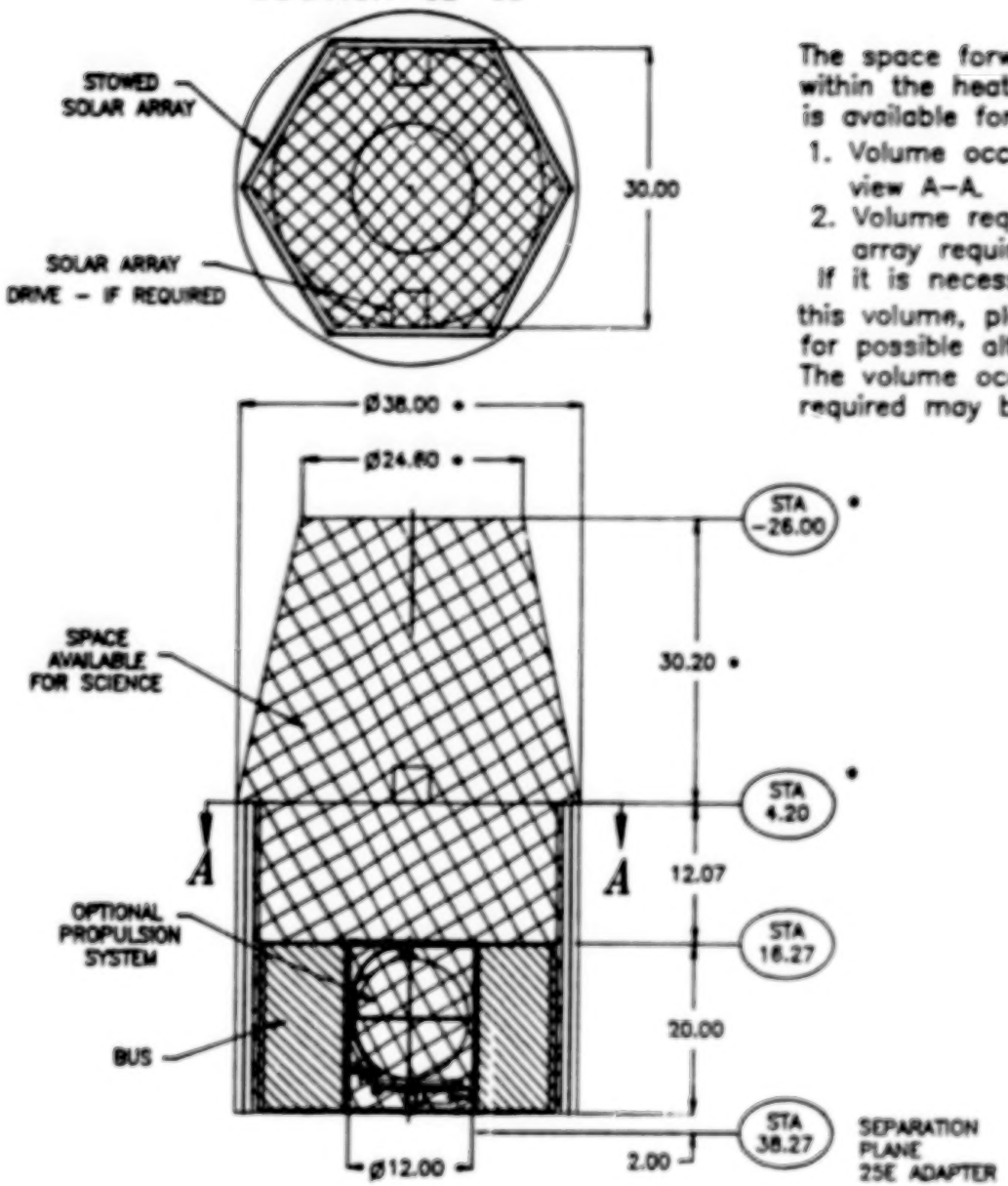
2.1.2 Thermal Control

The instrument will be thermally isolated from the bus as much as possible within physical and cost constraints. The experimenter will be responsible for the thermal design and control of the instrument. The bus side of the interface will be maintained between 0 and 40 degrees,



SCOUT CLASS SPACECRAFT BUS AND
INSTRUMENT GEOMETRIC ENVELOPE

FIGURE 5



The space forward of the Bus forward surface (sta. 16.27) within the heat shield payload envelope (noted by asterisk) is available for the science payload except:

1. Volume occupied by the stowed solar array shown in view A–A.
2. Volume required for solar array drive mechanism if the array requires articulation.

If it is necessary for the science payload to extend into this volume, please contact GSFC, Code 741.1 to arrange for possible alternative placement of the solar array. The volume occupied by the propulsion system if not required may be used for science.

A-00

SPACE AVAILABLE FOR INSTRUMENT MODULE
(APPROXIMATE DIMENSIONS, IN INCHES)

FIGURE 6

TABLE 1

MASS AND POWER SUMMARY (ESTIMATED)

	MASS OF S/C BUS PLUS SEPARATION SYSTEM (NOTE 1) (KG)	AVG POWER AVAILABLE TO THE SCIENCE INSTRUMENT (NOTE 2) (W)
SPINNERS		
Sun-Synchronous Polar, 6am/6pm	128	76
Sun-Synchronous Sun pointer (Polar, 6am/6pm)	125	93
Sun pointer (Other orbits)	125	71
3-AXIS INERTIALLY STABILIZED		
Sun-Synchronous Sun Pointer (Polar, 6am/6pm orbit)	130	83
Sun Pointer (Other orbits)	130	61
Stellar Pointer	138	44
3-AXIS NADIR/ZENITH STABILIZED (IRPO)		
Sun-Synchronous Polar, 6am/6pm	132	81

NOTES: 1) Bus mass includes articulation mechanism for solar arrays, where appropriate, but does not include the optional propulsion system. Maximum additional mass for the latter is 17.6 kg. See Section 2.1.4 for propulsion system information.

2) See Section 2.1.6 for assumptions leading to these values. Values here do not include power for thermal control of the propulsion system.

Centigrade. The GSFC will supply energy flux predictions to the experimenter.

Heater power for the instrument will be drawn from the total power allocated to the instrument. Demanding temperature and gradient requirements could call for a significant amount of heater power. If only certain components of the instrument have strict temperature limits, these parts should be isolated and heated rather than trying to control the entire instrument to those limits.

2.1.3 Attitude Control and Stabilization

Three fundamentally different Attitude Control Systems are planned: a spinner, a zenith/nadir pointer, and a solar/stellar pointer. Pointing requirements for the selected experiments will be met by choosing sensors, torquers, and system configurations from a standard set of electronics, sensors, and actuators. Fine sensors are not included in the standard set of components. For solar or stellar missions requiring fine pointing, it is expected that the experimenter will define and provide fine sensors, and will account for their weight, power, thermal control, alignment, and alignment stability.

The spinner will utilize the residual spin after fourth stage separation and appendage deployment. Spin rate adjustment, nutation damping, spin vector attitude control and determination sensors will be added to meet specific mission requirements. Spin vector pointing will be accurate to 0.5 degrees and jitter will be less than 0.1 degrees, peak to peak.

The zenith/nadir pointer will utilize one or two momentum wheels, electromagnets, and appropriate horizon scanners to orient the experiment's viewing axis to local vertical. Accuracy depends on orbit circularity and number of scanners, but pointing within 0.5 degrees of vertical is achievable. Jitter will be less than 0.1 degrees, peak-to-peak. Yaw accuracy will be better than 2 degrees.

The solar/stellar pointer will point at the sun or specified star with an accuracy limited by the fine sensor. Accuracies in the range of an arc minute are readily achievable with fine sensor technology, and greater accuracy can be achieved depending on the fine sensor chosen. If a stellar fine sensor is not used, offsets from the solar vector will enable stellar pointing to an accuracy of 0.5 degrees and jitter will be less than 0.1 degrees, peak to peak. This system will be able to use a fine guidance error signal generated by the science instrument to improve pointing

accuracy. Two momentum wheels will be used as primary torque generators, allowing reasonably fast maneuvering between targets.

2.1.4 Orbit Adjustment

Missions tolerating only small errors, such as those in sun-synchronous orbits, will use a propulsion system for orbit correction. A propulsion system also will be needed for missions at lower altitudes to counteract drag effects.

The mass for such a system has not been included in the bus mass given in Section 2.1.1. The mass is 17.6 kg, including 12.3 kg of propellant. For the circular orbit's 0.95 probability contour in Figure 4, removing the apogee and perigee errors requires up to 8 kg of fuel. The fuel requirement decreases as the error tolerance increases.

The propulsion system is an option and its mass will be charged to the instrument module.

2.1.5 Communications and Data Handling

For the Scout-class Explorer Series, functions performed by the C&DH systems will consist of:

- analog to digital conversion and parallel to serial conversion of non-serial input data

- provision of format related timing signals to data sources for data transfer timing

- arrangement of the input data into a format, consistent with preservation of the input data rate, for modulation of an RF telemetry transmitter

- direction of the formatted data to/from mass data storage devices and to the downlink transmitter(s)

- control of the transponder, transmitter and mass data storage (tape system) modes of operation

- transmission of data to earth stations at signal levels consistent with data rates and earth receiver capabilities

- reception of commands from earth stations

- decoding detected command modulation and processing command data for determination of command type, immediacy and forwarding address

- temporary random access memory (RAM) storage of system commands and issuance of these commands at the required time

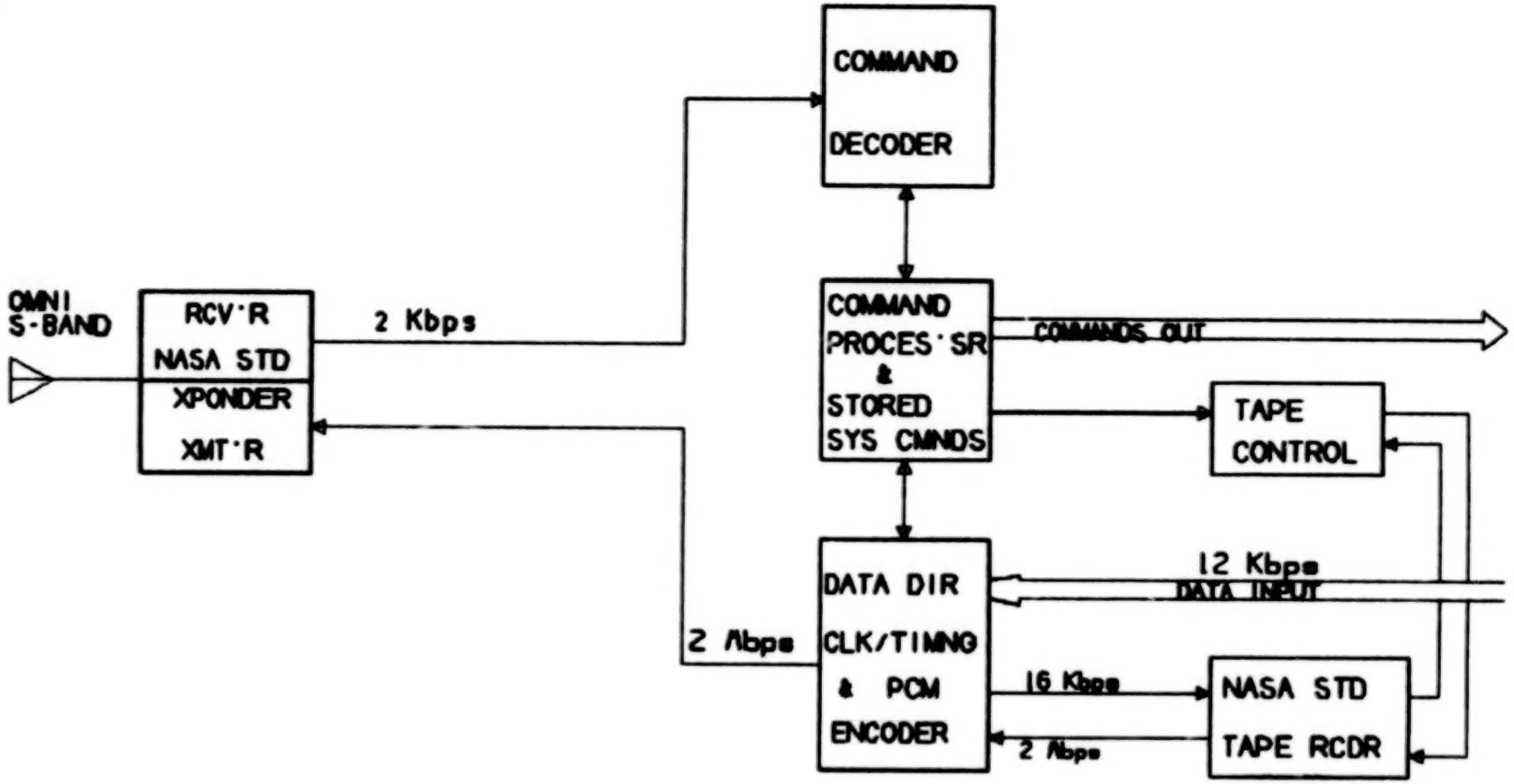
- provision of the spacecraft clock/calendar for correlation with command time-tags, data annotation and other critical spacecraft timing needs.

Figure 7 is a block diagram showing these system functions.

The telemetry data PCM encoder operates at a fixed data output rate of 16 Kbs. Science input data rates to approximately 12 Kbs can be accommodated. The NASA Standard Tape Recorder planned for mass data storage will hold 1 Gb of data which can be totally dumped to a ground station in just under 9 minutes at the planned rate of 2 Mbps.

Science and bus data may be interleaved to form a standard PCM format (i.e, 16x32, 32x32 words/frame) to maximally preserve input data rates.

The command processor will store up to 1000 system commands. Stored commands are issued as time-tagged, delta-time (related to a previous event), or immediate. Stored system commands can hold up to 32 bits of data and will be issued at two second intervals. Time is determined by an on-board 24-hour clock which has a basic stability of 5 parts in a million. The clock can be updated by command and its rate adjusted to optimize stability. Batch commands having inter-command intervals of much less than the 2 second command interval are accommodated.



PROPOSED SCOUT-EXPLORER C&DH CONFIGURATION

FIGURE 7

Types of command outputs are:

low-level discrete	5v, TTL compatible *
high-level discrete	28v, into 600 ohms *
32 bits of serial data	TTL compatible

*Discrete commands have programmable lengths ranging from several microseconds to several hundreds of milliseconds.

A special case of the immediate command is the serial data command. This command mode accommodates batch loads of data for upload at a 2 Kbps rate. The batch load quantity is not inherently limited by the on-board system, but will be limited in quantity to an amount that can be verified and resent during the same station pass.

Distribution of these commands between bus and science activities depends upon specific mission requirements.

2.1.6 Power

The spacecraft power subsystem will provide power to the instrument module as given in Table 1. Power is derived from fixed or single axis articulated solar arrays and batteries.

Normal operating voltage will range between 25 and 33 volts, but the science instrument must be capable of surviving 21 to 35 volts.

Available power depends on the orbit and the spacecraft configuration. The data in Table 1 are for typical missions using the following assumptions: 24 square feet of solar array area, 500 km altitude, 18 month mission, articulating arrays, no shadowing of the arrays, and stellar pointing spacecraft may be rolled to any angle. The affects of increasing the solar array area are being investigated.

2.2 Environment

The science instrument must survive the conditions described in the following sections.

2.2.1 Launch and Early Orbit

The Scout launch environment is described in detail in the Scout Planning Guide.

During the early orbits there will be some volatile materials that outgas from the spacecraft, water vapor being a good example. Ordinarily, the recondensation of volatiles is a problem only on cold surfaces such as space-exposed optics.

For some missions, a propulsion system will perform orbit adjustment maneuvers during the early orbit phase and, perhaps, later. These adjustments will produce accelerations and possible contamination from rocket exhaust material.

2.2.2 Electromagnetic Cleanliness

Reasonable care will be exercised to minimize static and dynamic magnetic fields within the spacecraft. However, NiCd batteries, magnetic torquers and momentum wheels will produce fields strong enough to interfere with highly precise in situ magnetic measurements. The anticipated magnetic field levels in the instrument volume of the spacecraft will be comparable to the ambient Earth field. There will be no attempt to provide an equipotential surface.

2.2.3 Radiation Environment

Radiation of concern is received from the galaxy, sun, and trapped radiation belts. The instantaneous environment depends on the geographic position of the spacecraft and whether the spacecraft is in sunlight; the accumulated radiation depends on the altitude and inclination of the orbit. A good, quick treatment, is available in the "Handbook of Space Astronomy and Astrophysics," M.V. Zombeck, Cambridge University Press, 1982.

3.0 PRE-LAUNCH MISSION OPERATIONS

3.1 Design and Development

The GSFC, the technical field center for the program, will define the electrical and mechanical interfaces between the instrument module and the spacecraft bus. An Interface Control Document will be developed jointly by the GSFC and the PI. The GSFC will provide technical coordination to insure compliance with the interface requirements.

3.2 Integration and Test

Spacecraft will be mechanically and electrically integrated at the GSFC. All-up systems tests will include functional testing and environmental qualification.

4.0 GROUND SYSTEMS FOR FLIGHT OPERATIONS

Ground stations receive telemetry, transmit commands, an track the spacecraft. Ground systems do telemetry processing, command generation, orbit and attitude determination and control, data capture, and data transmission to the PI.

Direct links to TDRS will not be used because of weight, power, volume, and cost constraints. Therefore, only ground stations will be used and contacts will be limited.

A NASA institutional ground station, that is, one that NASA operates to support a multitude of spacecraft, will be used for missions launched from Wallops or Vandenberg. One or two contacts per day can be scheduled. Facilities at the GSFC will be used for spacecraft monitoring and control, command generation and management, orbit and attitude determination and control, and data capture and processing. The demodulated science data stream will be extracted from the telemetry downlink and provided to the PI. Figure 8 shows a block diagram of this system.

A spacecraft launched into low inclination orbit from the San Marco complex would require a ground station located near the equator. Presently, no suitable NASA institutional ground station is planned. However, the feasibility of using one or more equatorial stations, NASA or non-NASA, will be investigated.

Another possible way to conduct mission operations may be for NASA to provide a self-contained, transportable ground station to be operated by the PI. In this concept, the station would be located at the PI's facility or other suitable place. The PI would perform all ground system functions with NASA providing only backup support. This system also could be used before launch for integration and test. Figures 9 and 10 illustrate this system concept.

It is expected that support of the initial flights may be limited to use of NASA institutional capabilities. However, proposers are encouraged to

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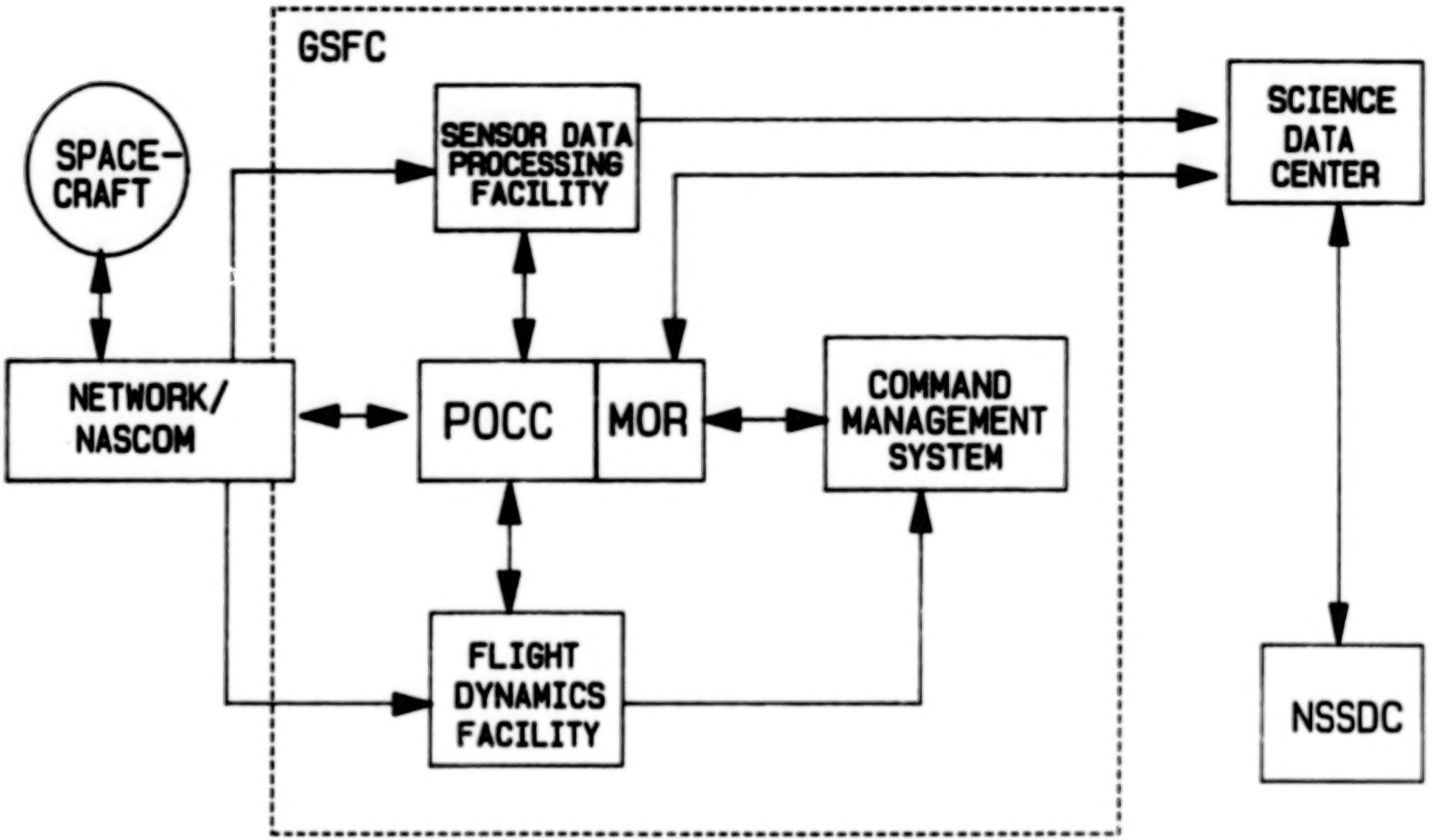
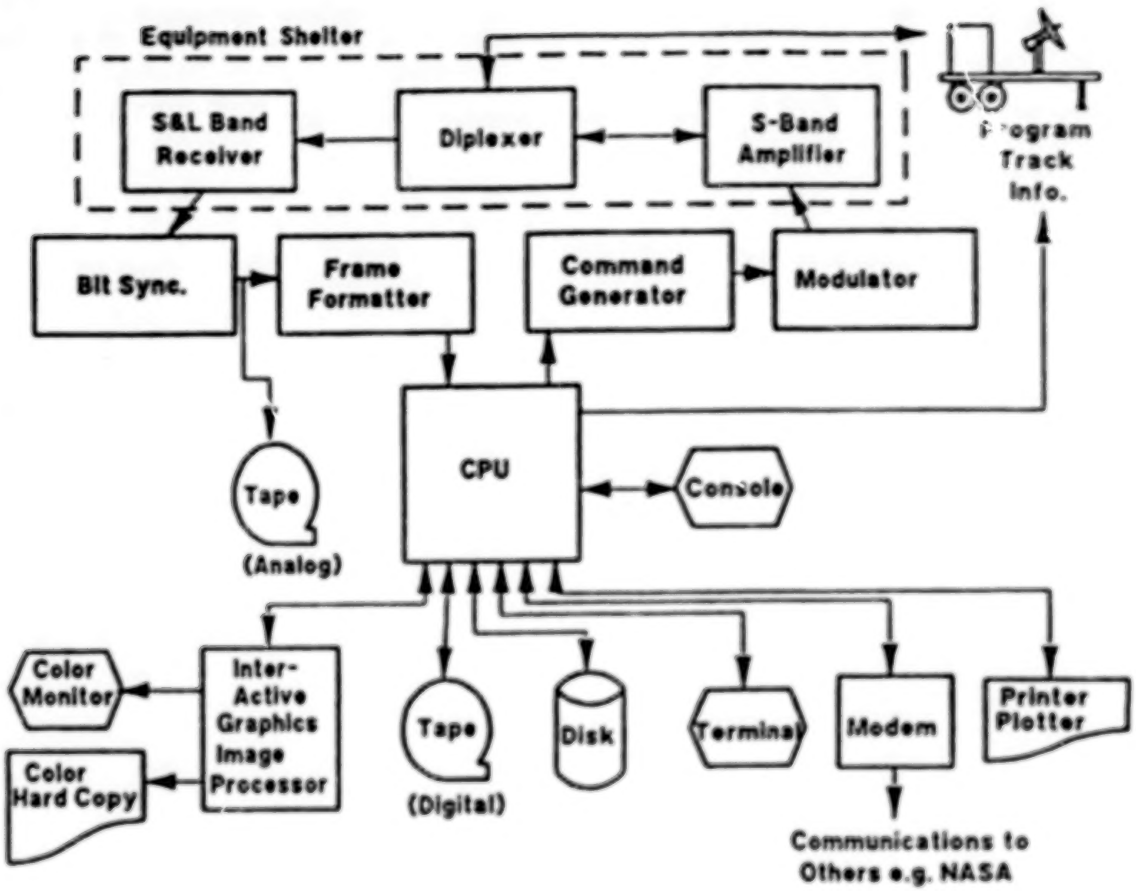


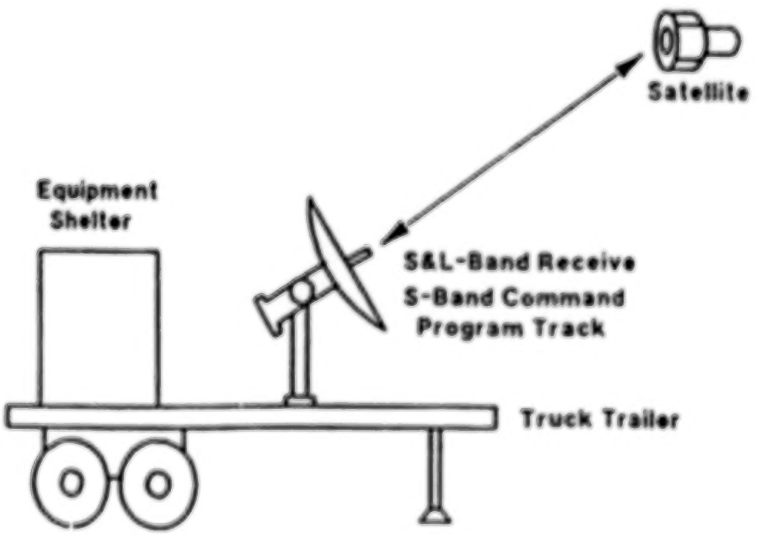
POCC Payload Operations Control Center
MOR Mission Operations Room
NSSDC National Space Science Data Center

FIGURE 8



TRANSPORTABLE GROUND SYSTEM CONFIGURATION

FIGURE 9



TRANSPORTABLE GROUND STATION

FIGURE 10

consider ground support options that would optimize mission science productivity. Ground support options which do not utilize NASA institutional systems should be priced separately from the base proposal with adequate justification and operations definition to facilitate evaluation by NASA. Other ground support examples might be for joint NASA-foreign missions to utilize, on a no-cost-to-NASA basis, the ground tracking facilities of the associated foreign countries to increase the frequency of contact with the spacecraft. Proponents of other missions may wish to contract with commercial vendors for the requisite ground support functions.

APPENDIX B

GENERAL INSTRUCTIONS AND PROVISIONS

I. INSTRUMENTATION AND/OR GROUND EQUIPMENT

By submitting a proposal, the investigator and institution agree that NASA has the option to accept all or part of the offeror's plan to provide the instrumentation or ground support equipment required for the investigation or NASA may furnish or obtain such instrumentation or equipment from any other source as determined by the selecting official. In addition, NASA reserves the right to require use, by the selected investigator, of Government instrumentation or property that subsequently becomes available, with or without modification, that will meet the investigative objectives.

II. TENATIVE SELECTIONS, PHASED DEVELOPMENT, PARTIAL SELECTIONS, AND PARTICIPATION WITH OTHERS

By submitting a proposal, the investigator and the organization agree that NASA has the option to make a tentative selection pending a successful feasibility or definition effort. NASA has the option to contract in phases for a proposed experiment, and to discontinue the investigative effort at the completion of any phase. The investigator should also understand that NASA may desire to select only a portion of the proposed investigation and/or that NASA may desire the individual's participation with other investigators in a joint investigation, in which case the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a NASA selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its team leader or contact point.

III. SELECTION WITHOUT DISCUSSION

The Government reserves the right to reject any or all proposals received in response to this Announcement when such action shall be considered in the best interest of the Government. Notice is also given of the possibility that any selection may be made without discussion (other than discussions conducted for the purpose of minor clarification). It is therefore emphasized that all proposals should be submitted initially on the most favorable terms that the offeror can submit.

IV. FOREIGN PROPOSALS

See Appendix C, Section II, paragraph 3.

V. TREATMENT OF PROPOSAL DATA

It is NASA policy to use information contained in proposals and quotations for evaluation purposes only. While this policy does not require that the proposal or quotation bear a restrictive notice, offerors or quoters should, in order to maximize protection of trade secrets or other information that is commercial or financial and confidential or privileged, place the following notice on the title page of the proposal or quotation and specify the information, subject to the notice by inserting appropriate identification, such as page numbers, in the notice. In any event, information (data) contained in proposals and quotations will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

RESTRICTION ON USE AND DISCLOSURE OF PROPOSAL AND QUOTATION INFORMATION (DATA)

The information (data) contained in (insert page numbers or other identification) of this proposal or quotation constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed for other than evaluation purposes; provided, however, that in the event a contract is awarded on the basis of this proposal or quotation the Government shall have the right to use and disclose this information (data) to the extent provided in the contract. This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

VI. STATUS OF COST PROPOSALS (U.S. PROPOSALS ONLY)

The investigator's institution agrees that the cost proposal submitted in response to the Announcement is for proposal evaluation and selection purposes, and that following selection and during negotiations leading to a definitive contract, the institution will be required to resubmit or execute a Standard Form (SF) 1411 "Contract Pricing Proposal Cover Sheet" and all certifications and representations required by law and regulation.

VII. LATE PROPOSALS

The Government reserves the right to consider proposals or modifications thereof received after the date indicated for such purpose, should such action be in the interest of the Government.

VIII. SPACE TRANSPORTATION SYSTEM INVESTIGATIONS

Investigators are advised that candidate investigations for Space Transportation System (STS) missions can come from many sources. These sources include those selected through the Announcement of Opportunity, those generated by NASA in-house research and development, and those derived from contracts and other agreements between NASA and external entities.

IX. DISCLOSURE OF PROPOSALS OUTSIDE GOVERNMENT

NASA may find it necessary to obtain proposal evaluation assistance outside the Government. Where NASA determines it is necessary to disclose a proposal outside the Government for evaluation purposes, arrangements will be made with the evaluator for appropriate handling of the proposal information. Therefore, by submitting a proposal the investigator and institution agree that NASA may have the proposal evaluated outside the Government. If the investigator or institution desire to preclude NASA from using an outside evaluation, the investigator or institution should so indicate on the cover. However, notice is given that if NASA is precluded from using outside evaluation, it may be unable to consider the proposal.

X. EQUAL OPPORTUNITY (U.S. PROPOSALS ONLY)

By submitting a proposal, the investigator and institution agree to accept the following clause

EQUAL OPPORTUNITY

During the performance of this contract, the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

2. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (a) employment, (b) upgradIng, (c) demotion, (d) transfer, (e) recruitment or recruitment advertising, (f) layoff or termination, (g) rates of pay or other forms of compensation, and (h) selection for training, including apprenticeship.

3. The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

4. The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

5. The Contractor shall send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding the notice to be provided by the Contracting Officer, advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

6. The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

7. The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. Standard Form 100 (EEO-1), or any successor form, is the prescribed form to be filed within 30 days following the award, unless filed within 12 months preceding the date of award.

8. The Contractor shall permit access to its books, records, and accounts by the contracting agency or the Office of Federal Contract Compliance Programs (OFCCP) for the purposes of investigation to ascertain the Contractor's compliance with the applicable rules, regulations, and orders.

9. If the OFCCP determines that the contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, the contract may be cancelled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

10. The Contractor shall include the terms and conditions of subparagraph 1 through 9 of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

11. The Contractor shall take such action with respect to any subcontract or purchase order as the contracting agency may direct as means of enforcing these terms and conditions, including sanctions for non-compliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

XI. PATENT RIGHTS

1. For any contract resulting from this solicitation awarded to other than a small business firm or nonprofit organization, the clause at NFS 18-52.227-70, "New Technology," shall apply. Such contractors may, in advance of contract, request waiver of rights as set forth in the provision at NFS 18-52.227-71, "Requests for Waiver of Rights to Inventions."

2. For any contract resulting from this solicitation awarded to a small business firm or nonprofit organization, the clause at FAR 52.227-11, "Patent Rights--Retention by the Contractor (Short Form)" (as modified by NFS 18-52.227-11), and the clause at NFS 18-52.227-73, "Patent Rights Clause for Subcontracts," shall apply.

APPENDIX C

GUIDELINES FOR PROPOSAL PREPARATION

The following guidelines apply to the preparation of proposals by potential investigators in response to an Announcement of Opportunity. The material presented is merely a guide for the prospective proposer and not intended to be all encompassing or directly applicable to the various types of proposals which can be submitted. The proposer should, however, provide information relative to those items applicable or as otherwise required by the Announcement of Opportunity.

I. COVER LETTER

A letter or cover page should be forwarded with the proposal. It should be signed by the investigator and an official by title of the investigator's organization who is authorized to commit the organization that is responsible for the proposal and its contents.

II. TABLE OF CONTENTS

The proposal should contain a table of contents.

III. IDENTIFYING INFORMATION

The proposal should contain a short descriptive title for the investigation, the names of all investigators, the name of the organization or institution and the full name, address, and telephone number of the Principal Investigator.

SECTION I

INVESTIGATION AND TECHNICAL PLAN

1. INVESTIGATION AND TECHNICAL PLAN

The investigation and technical plan generally will contain the following:

a. Summary. A simple, concise statement about the investigation, its conduct, and the anticipated results.

b. Objective and Significant Aspects. A brief definition of the objectives, their value, and their relationships to past, current, and future effort. The history and basis for the proposal and a demonstration of the need for such an investigation. A statement of present development in the discipline field.

c. Investigation Approach

(1) Fully describe the concept of the investigation.

(2) Detail the method and procedures for carrying out the investigation.

2. INSTRUMENTATION

This section should describe all information necessary to plan for experiment development, integration, ground operations, and flight operations. This section must be complete in itself without need to request additional data. Failure to furnish complete data may preclude evaluation of the proposal.

a. Instrument Description--This section should fully describe the instrumentation and indicate items which are proposed to be developed as well as any existing instrumentation. Performance characteristics should be related to the experiment objectives as stated in the proposal.

b. Instrument Integration--This section should describe all parameters of the instrument pertinent to the accommodation of the instrument in the spacecraft, Spacelab, Shuttle Orbiter, Space Station, etc. These include, but are not limited to volumetric envelope; weight; power requirements; thermal requirements; telemetry requirement; sensitivity to or generation of contamination (e.g., EMI gaseous effluents); data processing requirements.

c. Ground Operations--This section should identify requirements for pre-launch or post-launch ground operations support.

d. Flight Operations--This section should identify any requirements for flight operations support including mission planning. Operational constraints, viewing requirements, and pointing requirements should also be identified. Details of communications needs, tracking needs, and special techniques, such as extravehicular activity or restrictions in the use of control thrusters at stated times should be delineated. Special communications facilities that are needed must be described. Any special orbital requirements, such as time of month, of day, phase of moon, and lighting conditions are to be given in detail. Describe real-time ground support requirements and indicate any special equipment or skills required of ground personnel.

3. DATA REDUCTION AND ANALYSIS

A discussion of the data reduction and analysis plan including the method and format. A section of the plan should include a schedule for the submission of reduced data to the receiving point. In the case of Space Science programs, the National Space Science Data Center, Greenbelt, MD, will be the repository for such data and the Department of Interior, Sioux Falls, SD, for earth observations data.

4. ORBITER CREW AND/OR PAYLOAD SPECIALIST TRAINING REQUIREMENT

A description of the tasks required of each crew member (Commander, Pilot, Mission Specialist) or payload specialist should be provided, including the task duration and equipment involved. Indicate special training necessary to provide the crew members or payload specialist(s) with the capability for performiing the aforementioned tasks.

SECTION II

MANAGEMENT PLAN AND COST PLAN

A. MANAGEMENT PLAN

The management plan should summarize the management approach and the facilities and equipment required. Additional guidelines applicable to non-U.S. proposers are contained herein:

1. MANAGEMENT

a. The management plan sets forth the investigator's approach for managing the work, the recognition of essential management functions, and the overall integration of these functions.

b. The management plan gives insight into the organization proposed for the work, including the internal operations and lines of authority with delegations, together with internal interfaces and relationships with the NASA major subcontractors and associated investigators. Likewise, the management plan usually reflects various schedules necessary for the logical and timely pursuit of the work accompanied by a description of the investigator's work plan and the responsibilities of the co-investigators.

c. The plan should describe the proposed method of instrument acquisition. Specifically, it should include the following, as applicable.

(1) Rationale for the investigator to obtain the instrument through or by the investigator's institution.

(2) Method and basis for the selection of the proposed instrument fabricator.

(3) Unique or proprietary capabilities of the instrument fabricator that are not available from any other source.

(4) Contributions or characteristics of the proposed fabricator's instrument that make it an inseparable part of the investigation.

(5) Availability of supporting personnel in the institution to successfully administer the instrument contract and technically monitor the fabrication.

(6) Status of development of the instrument. What additional development is needed. Areas that need further design or in which unknowns are present.

(7) Method by which the investigator proposes to:

(a) Prepare instrument specifications.
(b) Review development progress.
(c) Review design and fabrication changes.
(d) Participate in testing program.
(e) Participate in final checkout and calibration.
(f) Provide for integration of instrument.
(g) Support the flight operations.
(h) Coordinate with co-investigators, other related investigations, and the payload integrator.
(i) Assure safety, reliability and quality.
(j) Provide required support for Payload Specialist(s), if applicable.

(8) Planned participation by small and/or minority business in any subcontracting for instrument fabrication or investigative support functions.

2. FACILITIES AND EQUIPMENT

All major facilities, laboratory equipment, and ground support equipment (GSE) (including those of the investigator's proposed contractors and those of NASA and other U.S. Government agencies) essential to the experiment in terms of its system and subsystems are to be indicated, distinguishing insofar as possible between those already in existence and those that will be developed in order to execute the investigation. The outline of new facilities and equipment should also indicate the lead time involved and the planned schedule for construction, modification, and/or acquisition of the facilities.

3. ADDITIONAL GUIDELINES APPLICABLE TO NON-U.S. PROPOSERS ONLY

The following guidelines are established for foreign responses to NASA's Announcement of Opportunity. Unless otherwise indicated in a specific announcement, these guidelines indicate the appropriate measures to be taken by foreign proposers, prospective foreign sponsoring agencies, and NASA leading to the selection of a proposal and execution of appropriate arrangements. They include the following:

a. Where a "Notice of Intent" to propose is requested, prospective foreign proposers should write directly to the NASA official designated in the Announcement of Opportunity and send a copy of this letter to the International Relations Division, Office of External Relations, Code XID, NASA, Washington, DC 20546, U.S.A.

b. Unless otherwise indicated in the Announcement of Opportunity, proposals will be submitted in accordance with this Appendix excluding cost plans. Proposals should be typewritten and written in English.

c. Persons planning to submit a proposal should arrange with an appropriate foreign governmental agency for a review and endorsement of the proposed activity. Such endorsement by a foreign organization indicates:

(1) The proposal merits careful consideration by NASA.

(2) If the proposal is selected, sufficient funds will be available to undertake the activity envisioned.

d. Proposals along with the requested number of copies and letters of endorsement from the foreign governmental agency must be forwarded to NASA in time to arrive before the deadline established for each Announcement of Opportunity. These documents should be sent to:

National Aeronautics and Space Administration
International Relations Division
Code XID
Office of External Relations
Washington, DC 20546
U.S.A.

e. All proposals must be received before the established closing date; those received after the closing date will be treated in accordance with NASA's provisions for late proposals. Sponsoring foreign goverment agencies may, in exceptional situations, forward a proposal directly to the above address if review and endorsement is not possible before the announced closing date. In such cases, NASA should be advised when a decision on endorsement can be expected.

f. Shonly after the deadline for each Announcement of Opportunity, NASA's International Relations Division will advise the appropriate sponsoring agency which proposals have been received and when the selection process should be completed. A copy of this acknowledgement will be provided to each proposer.

g. Successful and unsuccessful proposers will be contacted directly by the NASA Program Office coordinating the Announcement of Opportunity. Copies of these letters will be sent to the sponsoring Government agency.

h. NASA's International Relations Division will then begin making the necessary arrangements to provide for the selectee's participation in the appropriate NASA program. Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

(1) A letter of notification by NASA.
(2) An exchange of letters between NASA and the sponsoring foreign governmental agency.
(3) An agreement or Memorandum of Understanding between NASA and the sponsoring foreign governmental agency.

B. COST PLAN
(U.S. Investigations Only)

The cost plan should summarize the total investigation cost by major categories of cost as well as by function.

1. The categories of cost should include the following:

a. Direct Labor

List by labor category, with labor hours and rates for each. Provide actual salaries of all personnel and the percentage of time each individual will devote to the effort.

b. Overhead

Include indirect costs, which because of its incurrence for common or joint objectives, is not readily subject to treatment as a direct cost. Usually this is in the form of a percentage of the direct labor costs.

c. Materials

This should give the total cost of the bill of materials including estimated cost of each major item. Include lead time of critical items.

d. Subcontracts

List those over $25,000, specify the vendor and the basis for estimated costs. Include any baseline or supporting studies.

e. Special Equipment

Include a list of special equipment with lead and/or development time.

f. Travel

List estimated number of trips, destinations, duration, purpose, number of travelers, and anticipated dates.

g. Other Costs

Costs not covered elsewhere.

h. General and Administrative Expense

This includes the expenses of the institution's general and executive offices and other miscellaneous expenses related to the overall business.

i. Fee (if applicable).

2. Separate schedules, in the above format, should be attached to show total cost allocable to the following:

a. Principal Investigator and other Investigators' costs.
b. Instrument costs.
c. Integration costs.
d. Data reduction and analysis including the amount and cost of computer time.

3. If the effort is sufficiently known and defined, a funding obligation plan should provide the proposed funding requirements of the investigations by quarter and/or annum keyed to the work schedule.

APPENDIX D

PERFORMANCE ASSURANCE APPROACH

FOR

SMALL-CLASS EXPLORER MISSIONS

Reliability considerations for the Small-class Explorer Program are bounded by programmatic factors and the launch vehicle lift capability. Consequently, systems are expected to be predominantly "single string", with emphasis on simplicity of design while controlling cost. The acceptance of moderately increased risk of failure is, therefore, an acknowledged aspect of the program. A safety program appropriate for a payload on an expendable launch vehicle will be required.

The Performance Assurance (PA) requirements for the Small-class Explorer Program have been structured accordingly. Good quality parts and materials, a limited reliability and quality program, and heavy reliance on the test program will be key factors in balancing the reliability goals against the program cost and complexity constraints.

NASA plans to allow the proposer to have significant responsibility and control over the development of his experiments. Only limited overview by NASA is planned. Emphasis will be placed on those activities that contribute most to product integrity with deliverable documentation reduced, provided the proposer maintains an adequate internal record-keeping system that provides the necessary traceability when needed.

The PA requirements for the Small-class Explorer Program will recognize a wide variation in complexity, size, and technology of proposed instruments and spacecraft for a GSFC mission which can affect program risk and costs. The requirements will further recognize that there are significant differences in availability to investigators of facilities, personnel skills, and supporting capabilities. The PA program for hardware and software will provide controls and verification that assure hardware and software is designed, manufactured, and tested to flight standards and that drawing and specification requirements are met. These considerations will be realistically assessed in developing less stringent requirements to meet the Small-class Explorer Program. Although a specific Small-class Explorer Program PA requirements document will not be released until selection for this AO has been made, an outline of the presently envisioned requirements will be summarized in an addendum to this AO which will be distributed at the preproposal conference.

The proposer is required to develop a Performance Assurance Implementation Plan (PAIP). A brief preliminary PAIP is to be submitted with the proposal based on the requirements summarized in the addendum to be distributed at the preproposal conference. The final version will be negotiated prior to contract award based on the specific Small-class Explorer Program PA requirements.

The preliminary PAIP shall reflect the proposer's understanding of and approach to accomplishing the PA program to realistically address the cost associated with PA tasks. The proposer is encouraged to make maximum use of his or her existing practices and procedures in developing and executing the PAIP. Recognizing that some requirements may not be fully applicable because of a particular aspect of the instrument or mission, the proposer should identify such affected requirements and provide an appropriate rationale in the plan. The proposer may cite an alternate method of meeting the intent of a requirement when such method is more aligned with the manner in which total work is to be accomplished. The proposer must describe the plans for maintaining an adequate internal documentation trail for all PA activities and for providing NASA with the essential deliverable documentation it needs. The final negotiated PAIP shall address all applicable PA requirements describing the intended methods and extent of compliance to requirements, how they will be accomplished, and who will accomplish them.

When previously designed, fabricated, or flown hardware is proposed for use on a mission, the proposer must show that the hardware will meet the new mission requirements. Previous approvals obtained from NASA on the hardware and existing documentation should be identified for consideration of satisfying the PA requirements.

TENTATIVE AGENDA

ANNOUNCEMENT OF OPPORTUNITY
PREPROPOSAL CONFERENCE GSFS BUILDING 8
JUNE 21, 1988

0730	REGISTRATION	COFFEE
0900	WELCOME	
0915	NASA STRATEGY	
0930	PROGRAM	
1000	A. O. REVIEW	
1230	LUNCH	
1400	TECH OVERVIEW S/C BUS ORBIT CONSIDERATIONS GND STA/MISSION OPS R & QA CONSTRAINS	
1530	BREAK	
1545	PANEL SESSION QUESTIONS & ANSWERS	
1800	SUMMARY	

Enclosure 2a

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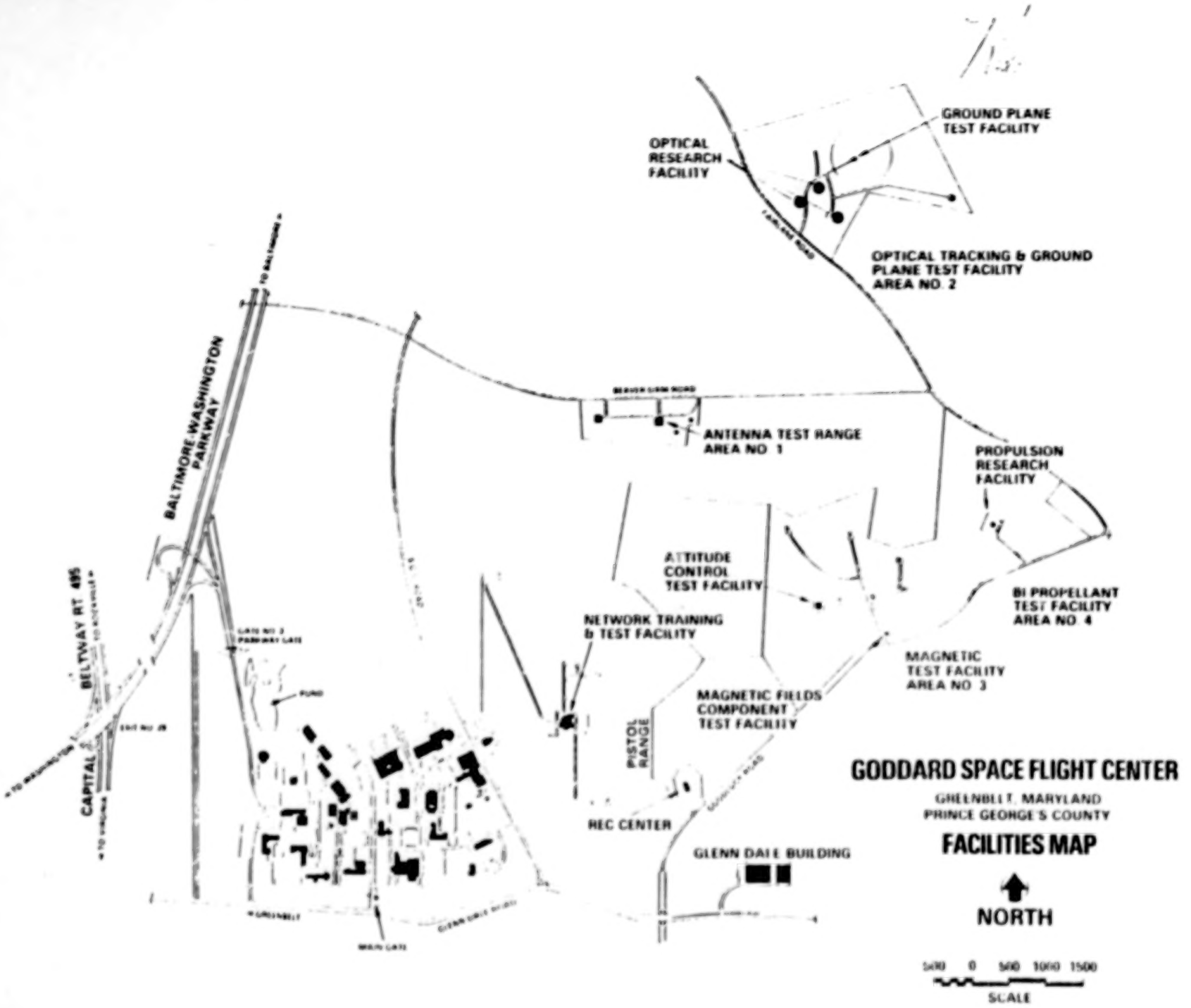
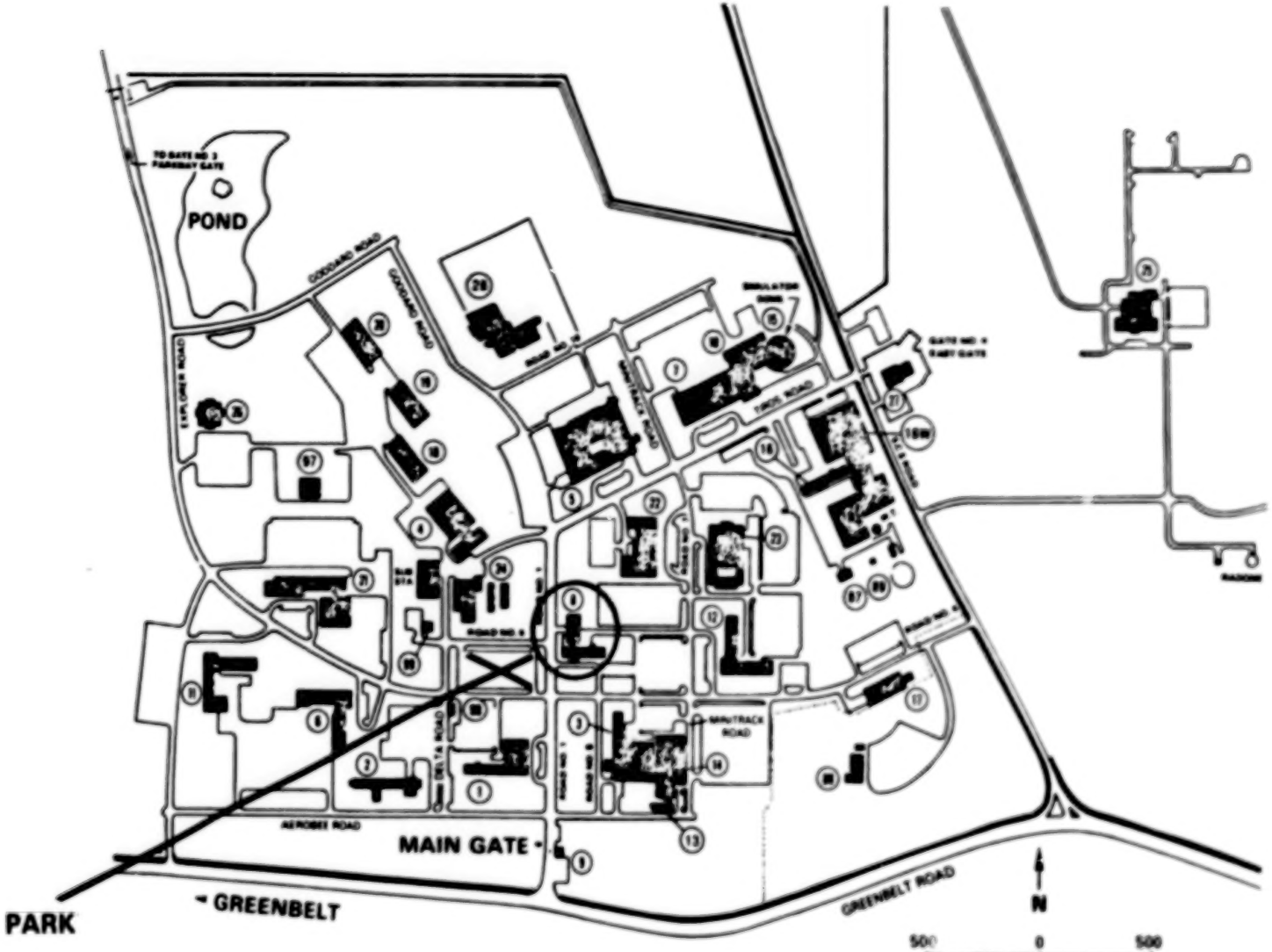


Enclosure 2b

GODDARD SPACE FLIGHT CENTER

LOCATION MAP



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MAIN SITE BUILDINGS

1. SPACE PROJECTS BUILDING– CAFETERIA, PERSONNEL, TRAVEL, SECURITY & I.D.
2. RESEARCH PROJECTS LABORATORY
3. CENTRAL FLIGHT CONTROL & RANGE OPERATIONS BUILDING
4. PLANT OPERATIONS BUILDING
5. INSTRUMENT CONSTRUCTION & INSTALLATION LABORATORY - HEALTH UNIT
6. SPACE SCIENCES LABORATORY
7. PAYLOAD TESTING FACILITY
8. ADMINISTRATION BUILDING
9. MAIN GATE HOUSE
10. ENVIRONMENTAL TESTING LABORATORY
11. APPLIED SCIENCES LABORATORY
12. TRACKING & TELEMETRY LABORATORY
13. NETWORK CONTROL CENTER FACILITY
14. SPACECRAFT OPERATIONS FACILITY
15. LAUNCH PHASE SIMULATOR
16. LOGISTIC & SUPPLY FACILITY SHIPPING & RECEIVING
16M. LOGISTIC & SUPPLY FACILITY
17. ADMINISTRATIVE SUPPORT BUILDING - BANK, SAFETY OFFICE, BID ROOM
18. ADMINISTRATIVE SUPPORT BUILDING
19. TECHNICAL SUPPORT BUILDING
20. TECHNICAL SUPPORT BUILDING, MAILROOM
21. METEOROLOGICAL SYSTEMS DEVELOPMENT LABORATORY CAFETERIA, LIBRARY, CREDIT UNION
22. SPACE & TERRESTRIAL APPLICATIONS FACILITY
23. DATA INTERPRETATION LABORATORY
24. CENTRAL HEATING & REFRIGERATION PLANT
25. NTTF AND HYDROMECHANICAL LABORATORY
26. NASA SPACE SCIENCE DATA CENTER
27. MOBILE EQUIPMENT SUPPORT FACILITY
28. TECHNICAL PROCESSING FACILITY
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87. GAS CYLINDER STORAGE BUILDING
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99. CENTER MANAGEMENT FACILITY

HOTEL/MOTEL LISTING
GREENBELT, MARYLAND AREA
JUNE 1988

In order to receive the reduced government/non-government (corporate) rates, please specify to the hotel that you are attending a meeting at Goddard, and that you are associated with the Small Explorer Program.

Add 10 percent sales tax to all prices quoted, unless otherwise stated.

The weekend rates are subject to availability.

SHERATON INN - 8500 Annapolis Road
New Carrollton, MD 20784
301-459-6700

	Occupancy	Non-Gov't Wkday	Non-Gov't Wkend	Gov't	Room Release Upon Late Arrival
Rates:	Single	$89	$49	$59	4 p.m.
	Double	$99	$59	$59	

Located approximately 5 miles from Goddard, at the intersection of Interstate 495 (Exit 20B) and Route 450.

HOLIDAY INN - 7200 Hanover Drive
Greenbelt, MD 20770
301-982-7000

	Occupancy	Non-Gov't Wkday	Non-Gov't Wkend	Gov't Wkday	Gov't Wkend	Room Release Upon Late Arrival
Rates:	Single	$72 to $76		$59	$59	6 p.m.
	Double	$72 to $82		$65	$65	

Rates depend on room view. Located 1-2 miles from Goddard at the intersection of Greenbelt Road and Hanover Drive (behind Greenway Shopping Center).

Enclosure 2c

HOLIDAY INN - CAPITOL BELTWAY - 10000 Baltimore Boulevard
College Park, MD 20740
301-345-6700

	Occupancy	Non-Gov't Wkday	Non-Gov't Wkend	Gov't Wkday	Gov't Wkend	Room Release Upon Late Arrival
Rates:	Single	$76	$76	$60	$60	6 p.m.
	Double	$79	$79	$60	$60	

Located off Interstate 495, take Exit 25A.

RAMADA INN - 5910 Princess Garden Parkway
Lanham, MD 20784
301-459-1000

	Occupancy	Non-Gov't Wkday	Non-Gov't Wkend	Gov't Wkday	Gov't Wkend	Room Release Upon Late Arrival
Rates:	Single	$68	$58	$58	$58	6 p.m.
	Double	$74	$58	$64	$58	

Located approximately 5 miles from Goddard, Exit 20A, on Interstate 495.

BEST WESTERN MARYLAND INN - 8601 Baltimore Boulevard
College Park, MD 20740
301-474-2800

	Occupancy	Nov-Gov't Wkday	Nov-Gov't Wkend	Gov't Wkday	Gov't Wkend	Room Release Upon Late Arrival
Rates:	Single	$59	$59	$53	$53	4 p.m.
	Double	$64	$64	$57	$57	

Located 5 miles from Goddard on the east side of Route 1 (Baltimore Boulevard), just south of Route 193.

BEST WESTERN ROYAL PINE MOTEL - 9113 Baltimore Boulevard
College Park, MD 20740
301-345-4900

	Occupancy	Non-Gov't Wkday	Non-Gov't Wkend	Gov't Wkday	Gov't Wkend	Room Release Upon Late Arrival
Rates:	Single	$46	$46	$41	$41	4 p.m.
	Double	$55	$55	$50	$50	

Located 5 miles from Goddard on the east side of Route 1 (Baltimore Boulevard), just north of Route 193.

GREENBELT HILTON - 6400 Ivy Lane
Greenbelt, MD 20770
301-441-3700

	Occupancy	Non-Gov't Wkday	Non-Gov't Wkend	Gov't Wkday	Gov't Wkend	Room Release Upon Late Arrival
Rates:	Single	$96	$96	$75	$69	6 p.m.
	Double	$111	$111	$90	$69	

Located off Baltimore-Washington Parkway (295). Exit 23 onto Kenilworth Avenue. Follow through one light. Take next left onto Ivy Lane. Second building on the left.

SCOUT-CLASS EXPLORER

ANNOUNCEMENT OF OPPORTUNITY

PREPROPOSAL CONFERENCE REGISTRATION FORM

GODDARD SPACE FLIGHT CENTER - BUILDING 8 AUDITORIUM

JUNE 21, 1988

NAME _____

ORGANIZATION _____

ADDRESS _____

_____

_____

NATIONALITY _____

TELEPHONE _____

CAR PASS REQUESTED **YES** ___ **NO** ___

NUMBER OF PEOPLE IN CAR _____

Please return this form to the following address by June 6, 1988;

Mr. Robert Pincus
NASA, GSFC
Code 740.2
Greenbelt, Maryland 20771

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NASA MAILING LIST UPDATE

The NASA Office of Space Science and Applications is in the process of **Updating** and **Enhancing** their scientific investigation mailing list. Please fill out all the following information, refold the questionaire, tape it, and mail it back to the preprinted address on the reverse side. Thank you for your time.

Please check (all that apply) the type of NASA Mailings you would like to receive.

- ☐ 1. Announcements of Opportunity
- ☐ 2. Space Science and Applications Notices
- ☐ 3. NASA Research Announcements (NRA)
- ☐ 4. Please **remove** my name from NASA Mailing List

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- ☐ 1. College or University
- ☐ 2. International
- ☐ 3. Minority Business
- ☐ 4. NASA Center
- ☐ 5. Non-Profit Corporation
- ☐ 6. Other Government Agency
- ☐ 7. Private Industry
- ☐ 8. Small Business

Program Involvement (check all that apply):

- ☐ 1. Principal Investigator
- ☐ 2. Co-Investigator
- ☐ 3. Management/Administration
- ☐ 4. General Interest
- ☐ 5. Flight Project
- ☐ 6. Suborbital Investigation
- ☐ 7. Data Analysis
- ☐ 8. Basic Research
- ☐ 9. Advanced Planning & Mission Definition
- ☐ 10. Science Working Group
- ☐ 11. NAS/NRC Advisory Committee
- ☐ 12. NASA Advisory Council or Committee
- ☐ 13. Committee(s): _____

OSSA Involvement (check all that apply):

- ☐ 1. Astrophysics
- ☐ 2. Communications
- ☐ 3. Earth Science and Applications
- ☐ 4. Information Systems
- ☐ 5. Life Sciences
- ☐ 6. Microgravity Science and Applications
- ☐ 7. Shuttle Payload Engineering
- ☐ 8. Solar System Exploration
- ☐ 9. Space Physics
- ☐ 10. None

Discipline (check all that apply):

- ☐ 1. Astronomy
- ☐ 2. Communications
- ☐ 3. Computer Sciences/Information Systems
- ☐ 4. Environmental Observations
- ☐ 5. Life Sciences
- ☐ 6. Microgravity Sciences
- ☐ 7. Planetary Sciences
- ☐ 8. Solar and Space Physics

NASA Contractor/Grantee: ☐ Yes ☐ No

(If YES, please provide current NASA/OSSA Contract & Grant Numbers and Designate Level of Responsibility)

P - Principal Investigator
C - Co Investigator
L - Team Leader

Example: [N,A,G,W,-,1,2,3,4,5,] [P]

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Signature: _____ **Date:** _____

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